United States
Department of
Agriculture

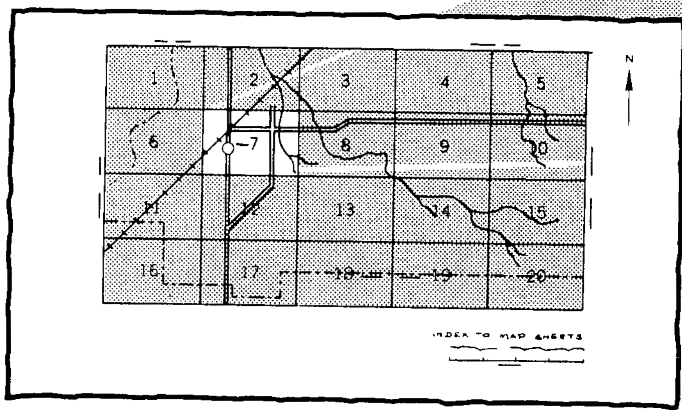
Soil
Conservation
Service

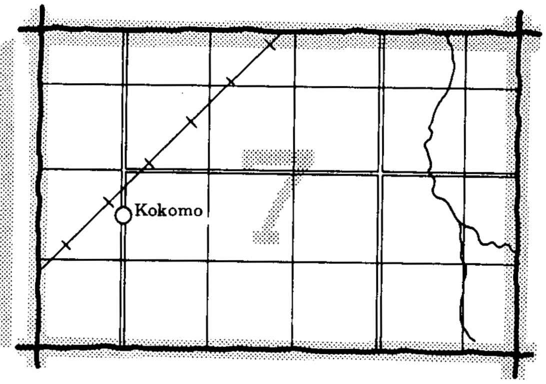
In cooperation with
Virginia
Polytechnic
Institute and
State University

Soil Survey of City of Virginia Beach, Virginia

HOW TO USE

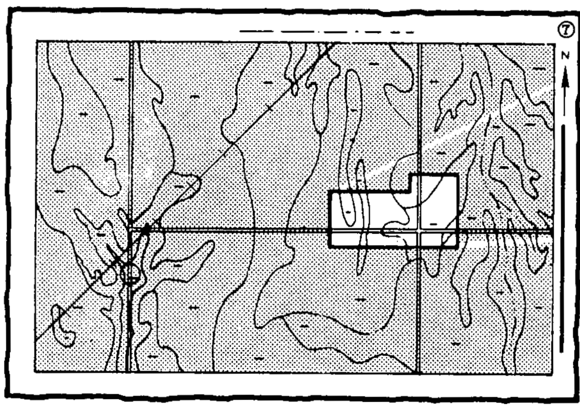
1. Locate your area of interest on the "Index to Map Sheets."

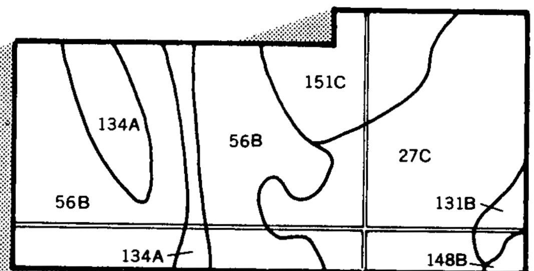




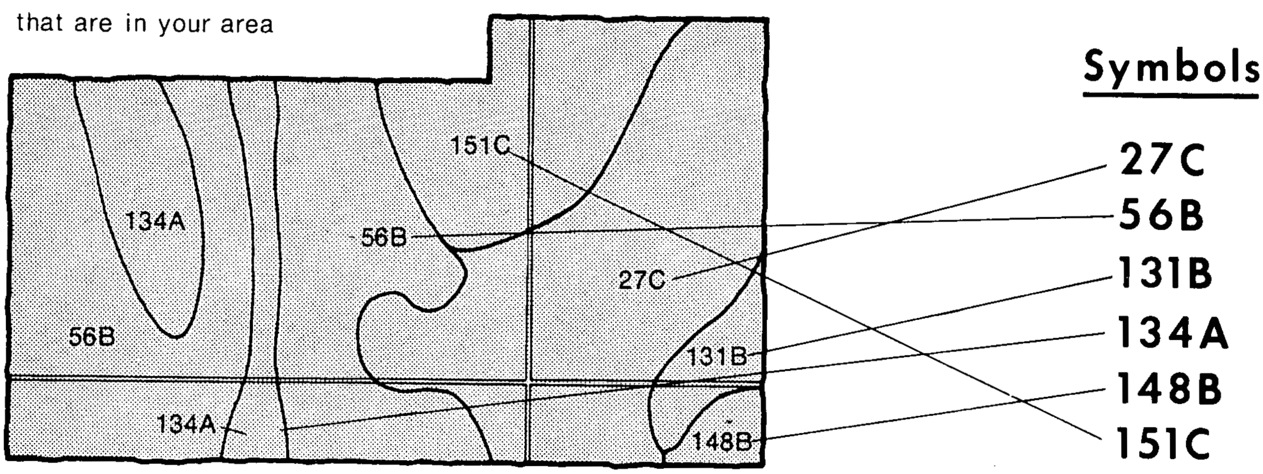
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



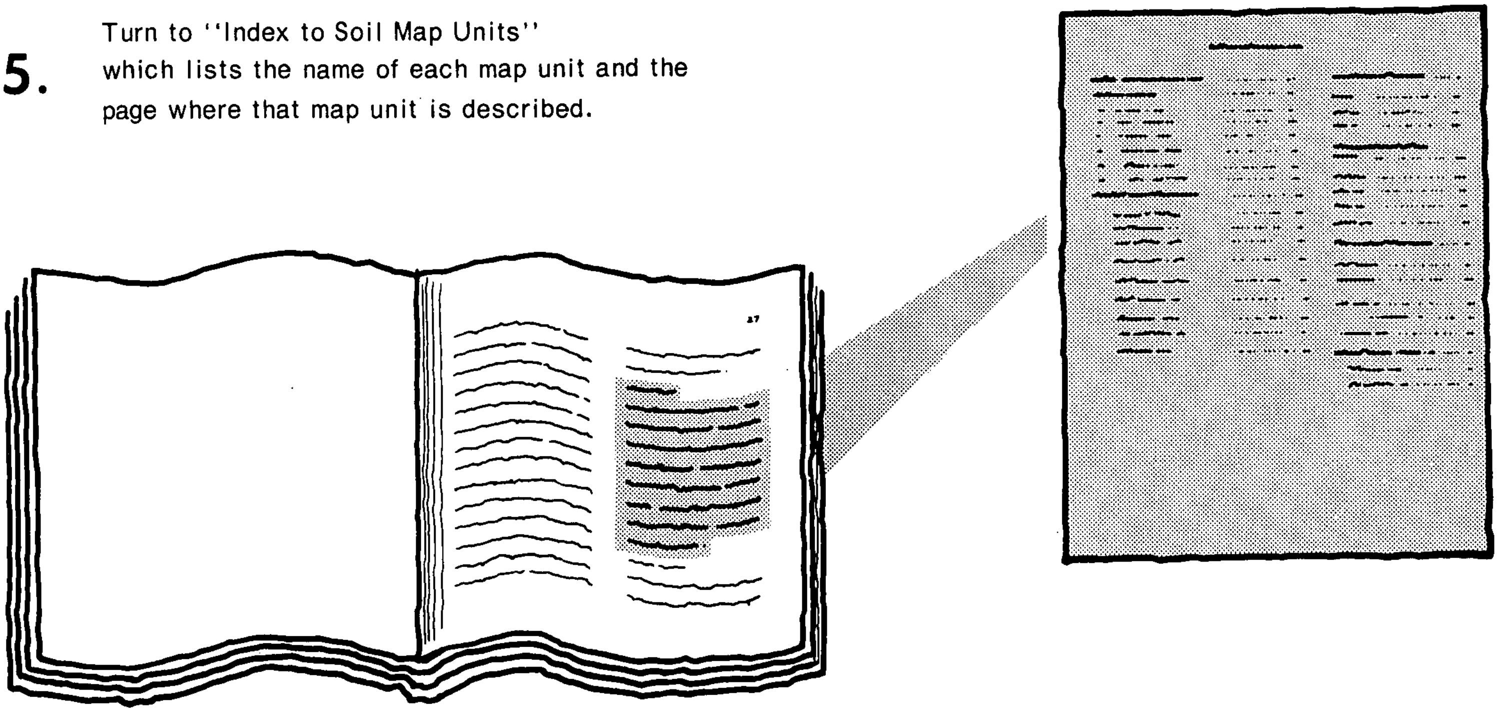


4. List the map unit symbols that are in your area

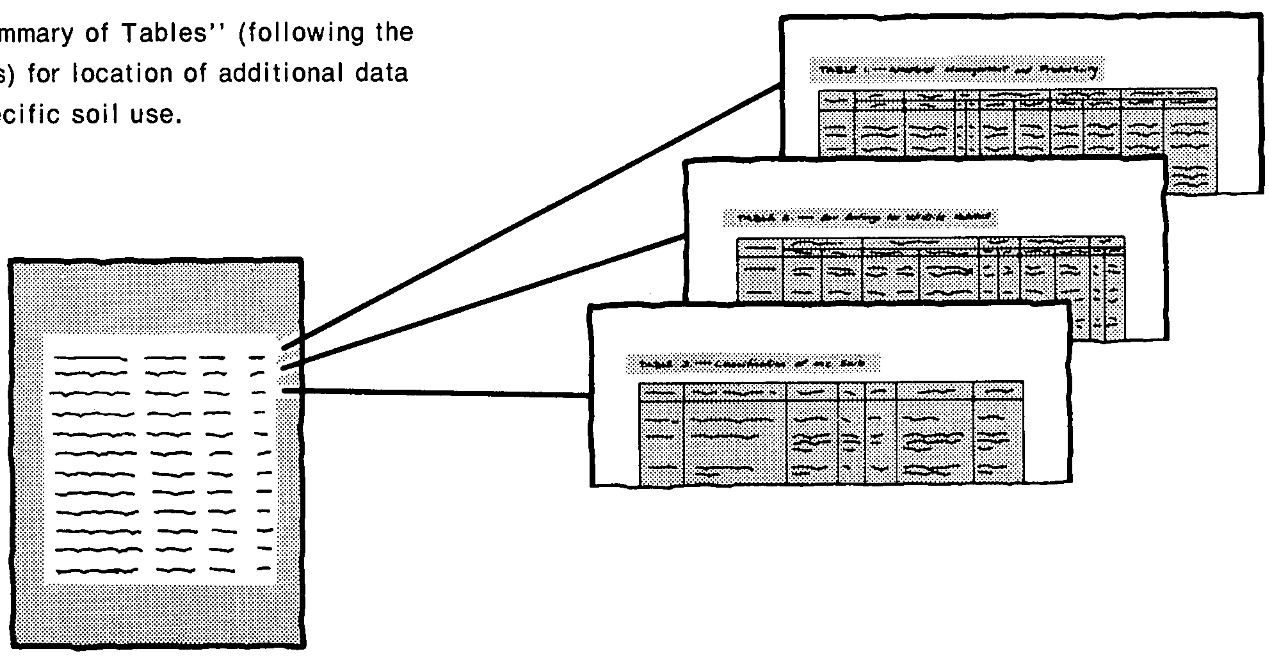


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service and the Virginia Polytechnic Institute and State University. The survey is part of the technical assistance furnished to the Virginia Dare Soil and Water Conservation District and was financed in part by the Virginia Soil and Water Conservation Commission and the City of Virginia Beach City Council.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: A cultivated area of Acredale silt loam adjacent to a housing development.

Contents

soil series

Issued September 1985

Index to Map Units

Summary of Tables

Foreword

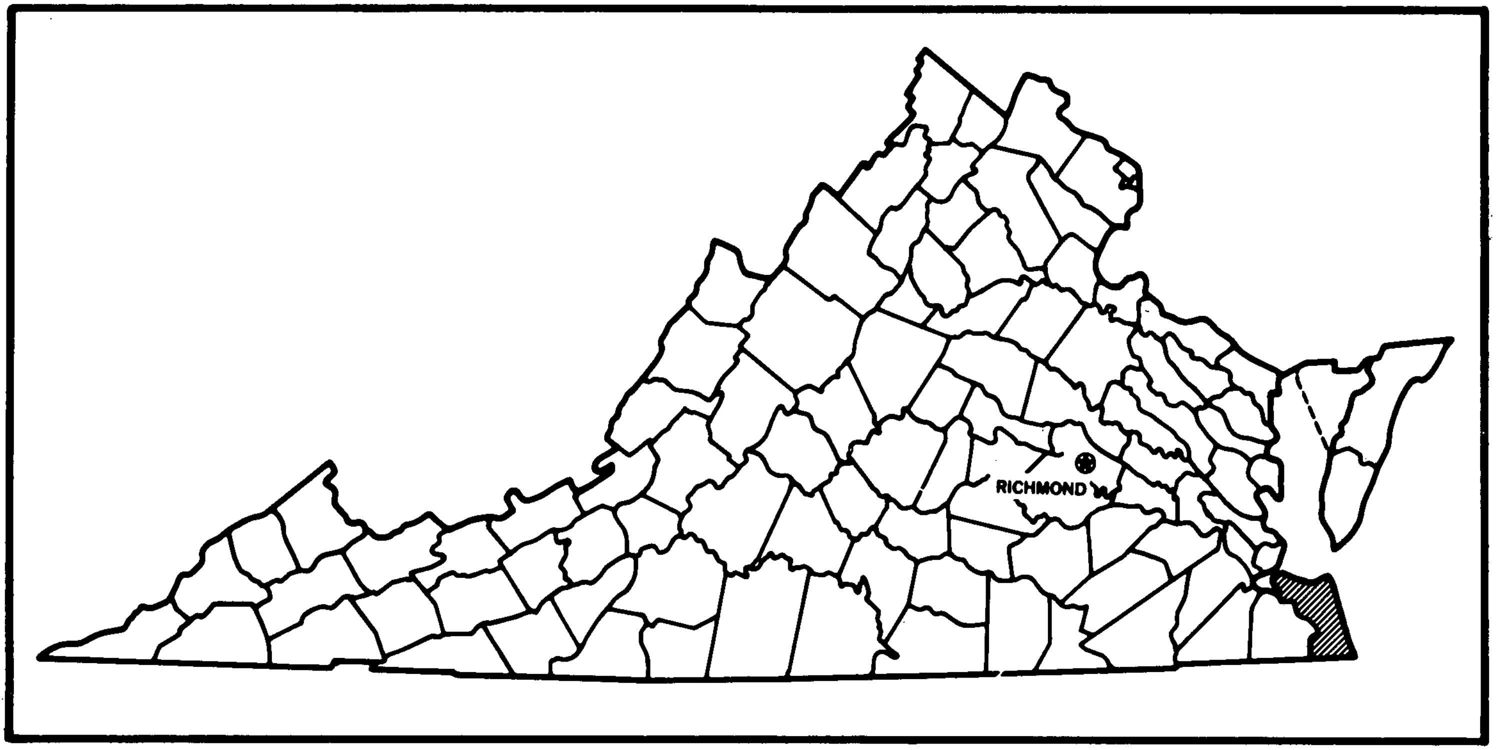
This soil survey contains information that can be used in land-planning programs in the City of Virginia Beach. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service, the Cooperative Extension Service, or the soil scientist for the City of Virginia Beach Environmental Services.

Manly S. Wilder
State Conservationist
Soil Conservation Service



Location of City of Virginia Beach in Virginia.

Soil Survey of
City of Virginia Beach, Virginia

By Danny R. Hatch, James E. Belshan, Steve M. Lantz,
George R. Swecker, and Dave E. Starner,
Virginia Polytechnic Institute and State Univesity

United States Department of Agriculture
Soil Conservation Service
in cooperation with
Virginia Polytechnic Institute and State University

THE CITY OF VIRGINIA BEACH is in the extreme southeastern corner of Virginia and was formed in 1963 from a merger of Princess Anne County and the town of Virginia Beach. Richmond, the State capital, is 117 miles to the northwest, and Raleigh, North Carolina, is 190 miles to the southwest. The City of Virginia Beach has an area of about 309 square miles, or 197,590 acres. Its population has grown from about 20,000 in 1940 to nearly 260,000 in 1981.

This soil survey provides additional and more detailed information to a survey that was published in 1945, when the area was known as Princess Anne County (*6*). The descriptions, names, and boundaries of the soils in this survey do not in all instances agree with those in the earlier survey or with those in adjoining counties. The differences are the results of an expanded knowledge of the soils, changes in methods of soil classification, and differences in the detail of the maps.

General Nature of the Survey Area

This section provides data about the climate of the survey area and describes some of the natural and cultural factors that influence land use.

Climate

Provided by Virginia Polytechnic Institute and State University.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Norfolk in the period 1949 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 42 degrees F, and the average daily minimum temperature is 33 degrees. The lowest temperature on record, which occurred at Norfolk on January 17, 1977, is 5 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Norfolk on July 23, 1952, is 103 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 45 inches. Of this, 25 inches, or 56 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 22 inches. The heaviest 1-day rainfall during the period of record was 7.41 inches at Norfolk on August 31, 1964. Thunderstorms occur on about 37 days each year, and most occur in summer.

The average seasonal snowfall is 7.2 inches. The greatest snow depth at any one time during the period of record was 11 inches. On an average of 1 day, at least 1

inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 58 percent. Humidity is higher at night, and the average at dawn is about 78 percent. The sun shines 63 percent of the time possible in summer and 56 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 10.6 miles per hour, in March.

The survey area frequently is subject to storms out of the northeast during fall, winter, and spring. These storms can produce localized flooding and severe shoreline erosion. The summer in Virginia Beach produces numerous thunderstorms whose strong winds and heavy rains sometimes result in localized flooding. Although Virginia Beach is north of the track usually followed by hurricanes and tropical storms, the City has been struck infrequently by hurricanes.

Physiography, Relief, and Drainage

The City of Virginia Beach lies entirely within the Tidewater area of the Atlantic Coastal Plain. The physiography of the survey area consists of narrow, subdued, well drained ridges; broad, poorly drained flats; and coastal areas (*3*). The ridges generally are oriented in a north-south direction and are separated by the broad flats. The rounded ridgecrests mainly are 5 to 15 feet above the lower lying flats. Some areas on Pungo Ridge have an elevation of 18 to 21 feet above sea level. The Oceana Ridge, in the northern part of the city, has some elevations as much as 25 to 30 feet above sea level, and slightly higher elevations are in some western parts of the city.

The coastal areas consist of marshes, beaches, and dunes. The dunes on the Outer Banks of the survey area typically range from 20 to 25 feet in elevation, but a few solitary dunes south of False Cape are about 55 feet above sea level. The wooded dunes in the Cape Henry area range from about 20 to 85 feet above sea level.

Most of the survey area is nearly level to gently sloping. Some areas near drainageways, mostly in the northern part of the survey area, are strongly sloping to steep. Dunes in the coastal areas are mostly gently sloping to steep.

Several large rivers and bays and many lakes and drainageways are throughout the survey area. Some drainageways are bordered by low ridges consisting of well drained or moderately well drained soils; some are bordered by a narrow rim of well drained to somewhat poorly drained soils that grade to poorly drained soils farther from the edge of the drainageway.

The drainage pattern in the survey area is fairly well defined in the northern third and is more poorly defined in the southern two-thirds. The northern areas are drained by the Lynnhaven River, Little Creek, and the Elizabeth River. The southern part is drained by West Neck, Back Bay, the North Landing River, and Blackwater Creek. These drainageways are influenced by windtides. The water is highest when sustained southerly breezes cause flooding in low-lying (generally less than 3 feet above sea level) areas adjacent to the drainageways. Remnants of a former small eastward-flowing drainage network, which includes Rudee Inlet, Owl Creek, Redwing Lake, and Lake Tecumseh, are part of a once larger system that has been nearly destroyed by headland retreat of the coast.

Industry

The City of Virginia Beach has a broad economy based on agriculture, tourism, light industry, and the military.

Most farms are in the southern part of the survey area. The major crops are corn, soybeans, and small grains and some vegetables and other specialty crops.

Much of the industry in the area is related to services for the more than 1.5 million tourists that visit Virginia Beach each year. Light industry and providing a civilian workforce and services for the numerous military installations in and near the survey area also play an important role in the local economy.

How This Survey Was Made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; and the kinds of native plants or crops. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those

characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

Areas dominated mostly by poorly drained to well drained soils; on uplands

The map units in this group mostly are inland. The soils formed mainly in marine and fluvial deposits on upland ridges and side slopes and on broad, nearly level flats. The soils have a subsoil that dominantly is loamy.

1. Acredale-Tomotley-Nimmo

Poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of nearly level soils in broad flat areas mainly in the central and southern parts of the City. Slopes range from 0 to 2 percent. The map unit makes up about 41 percent of the survey area. Acredale soils make up about 50 percent of the map unit, Tomotley soils about 18 percent, Nimmo soils about 14 percent, and soils of minor extent about 18 percent.

The Acredale soils are slowly permeable. They have a surface layer of silt loam, a subsoil of silt loam and silty clay loam, and a substratum of fine sandy loam.

The Tomotley soils are moderately permeable. They have a surface layer of loam, a subsoil of loam and sandy clay loam, and a substratum of loamy sand.

The Nimmo soils are moderately permeable. They have a surface layer of loam, a subsoil of sandy loam and loam, and a substratum of fine sand.

The minor soils are somewhat poorly drained Augusta, Chapanoke, and Dragston soils and very poorly drained Hyde, Nawney, and Portsmouth soils. The Augusta, Chapanoke, and Dragston soils are around the outer edges of this map unit and on small knolls at slightly higher elevations. The Hyde and Portsmouth soils are in slight depressions, and the Nawney soils are in swampy drainageways.

This map unit is used mostly for cultivated crops, but some areas are in woodland or are used for community development. A large part of the map unit has been cleared and drained; the drained areas have good suitability for cultivated crops. The unit is suitable for woodland, but wetness in some areas limits the use of heavy equipment. The main limitation for community development is a seasonal high water table.

2. State-Tetotum-Augusta

Well drained, moderately well drained, and somewhat poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of nearly level to gently sloping soils on broad ridges and side slopes. These areas are mainly in the northern part of the City. Slopes range from 0 to 6 percent. The map unit makes up about 15 percent of the survey area. State soils make up about 24 percent of the map unit, Tetotum soils about 22 percent, Augusta soils about 13 percent, and soils of minor extent about 41 percent.

The State soils are on side slopes. They have a surface layer of loam, a subsoil of loam, and a substratum of sandy loam. They are well drained and have moderate permeability.

The Tetotum soils are on low-lying ridges and side slopes. They have a surface layer of loam, a subsoil of loam and clay loam, and a substratum of loamy sand. They are moderately well drained and have moderate permeability.

The Augusta soils are on low-lying ridges and side slopes. They have a surface layer of loam. The upper part of the subsoil is loam and clay loam, and the lower part is clay loam. The substratum is loamy sand. The

soils are somewhat poorly drained and have moderate permeability.

The minor soils of this map unit are Urban land and Udorthents, poorly drained Acredale and Tomotley soils, well drained Bojac and Rumford soils, moderately well drained Yeopim soils, and somewhat poorly drained Chapanoke soils. The Chapanoke and Yeopim soils mainly are adjacent to major drainageways and have a subsoil mostly of silt loam or silty clay loam. The Rumford soils are on steeper side slopes. The Bojac soils have a subsoil of fine sandy loam and are on ridges. The Acredale and Tomotley soils are in depressions. Urban land and Udorthents commonly are in the vicinity of residential and commercial centers where the soils have been disturbed by grading and construction.

Most areas of this map unit are in community development or are used for cultivated crops. The remaining areas are in woodland. Most of the unit has good suitability for cultivated crops and woodland. Most areas are suited to community development, but some are limited by a seasonal high water table.

3. Dragston-Munden-Bojac

Somewhat poorly drained, moderately well drained, and well drained soils that have a loamy subsoil; formed in marine and fluvial sediments

This map unit consists of areas of nearly level soils on narrow ridges and side slopes throughout the City. Slopes range from 0 to 2 percent. The map unit makes up about 11 percent of the survey area. Dragston soils make up about 22 percent of this map unit, Munden soils about 21 percent, Bojac soils about 13 percent, and soils of minor extent about 44 percent.

The Dragston soils are somewhat poorly drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of sandy loam, and a substratum of sandy loam.

The Munden soils are moderately well drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of sandy loam and loam, and a substratum of sand.

The Bojac soils are well drained and have moderately rapid permeability. They have a surface layer of fine sandy loam, a subsoil of fine sandy loam and loam, and a substratum of fine sand.

The minor soils of this map unit are well drained State soils, moderately well drained Tetotum soils, somewhat poorly drained Augusta soils, poorly drained Nimmo soils, and very poorly drained Portsmouth soils. The Augusta and Tetotum soils are on ridges, on side slopes, and in slight depressions. The State soils are on upland ridges. The Nimmo soils are in slight depressions and on flats at lower elevations, and the Portsmouth soils are on flats and in depressions. In the southern part of the City these depressions are circular and are called Carolina Bays.

This map unit is used mainly for cultivated crops, but some areas are used for woodland or are in community development. Most of this map unit has been cleared, and some areas have been drained. The unit has good suitability for cultivated crops and woodland, and fair suitability for community development. The main limitations are a seasonal high water table and rapid permeability in the substratum.

4. Udorthents-Urban land

Well drained or moderately well drained soils that have a loamy substratum and areas covered by buildings and roads; formed in disturbed material

This map unit consists of nearly level to steep soils in urban areas that have been excavated and graded or covered by impervious material. These areas are mostly in the northern half of the City. Slopes range from 0 to 25 percent. The unit makes up about 8 percent of the survey area. Udorthents make up about 34 percent of this map unit, Urban Land about 31 percent, and soils of minor extent about 35 percent.

Udorthents are in areas that have been altered by excavation or covered by fill material. They are variable in color, texture, and permeability.

Urban land consists of areas covered by parking lots, buildings, and other structures.

The minor soils in this map unit consist of small areas of undisturbed soils.

Onsite investigation is needed to determine the suitabilities and limitations of this unit for any use.

Areas dominated mostly by very poorly drained mineral and organic soils; in marshes and swamps that are subject to flooding

The map units in this group are in coastal marshes and inland swamps. The soils formed in fluvial mineral deposits or in organic material. The soils have an organic substratum or a loamy substratum.

5. Dorovan-Pocaty-Nawney

Very poorly drained soils that consist of organic or loamy material; formed in organic material or fluvial sediments

This map unit consists of level, frequently flooded soils on the flood plains of the North Landing River, West Neck Creek, and their tributaries. The areas are mostly in the southwestern section of the City. Slopes range from 0 to 1 percent. The map unit makes up about 10 percent of the survey area. Dorovan soils make up about 41 percent of this map unit, Pocaty soils about 19 percent, Nawney soils about 9 percent, and soils of minor extent about 31 percent.

The Dorovan soils are in broad, forested flood plains. They have a surface layer of partially decomposed

organic material underlain by highly decomposed organic material.

The Pocaty soils are on broad, flat marshes. They have a surface layer of partially decomposed organic material underlain by layers of highly decomposed organic material that has a high sulphur content.

The Nawney soils are in wooded drainageways and on flood plains. They have a surface layer of silt loam and a substratum of loam and loamy sand.

The minor soils are poorly drained Acredale, Nimmo, and Tomotley soils; moderately well drained Munden and Tetotum soils; and somewhat poorly drained Augusta and Dragston soils. These soils are on ridges and nearly level transitional areas near uplands.

This map unit has little suitability for most uses other than as wetland wildlife habitat and for woodland. Flooding and the high content of organic matter are the main limitations.

6. Backbay-Nawney

Very poorly drained soils that have a thin organic surface layer over a loamy substratum; formed in fluvial sediments

This map unit consists of nearly level, frequently flooded soils on the flood plains of Back Bay and its tributaries. Most areas are in the southeastern section of the City. Slopes range from 0 to 1 percent. The unit makes up about 7 percent of the survey area. Backbay soils make up about 56 percent of the map unit, Nawney soils about 11 percent, and soils of minor extent about 33 percent.

The Backbay soils are in broad, flat marshes. They have a surface layer of partially decomposed organic material and a substratum of sandy clay loam and silty clay loam.

The Nawney soils are in wooded drainageways and on flood plains. They have a surface layer of silt loam and a substratum of loam and loamy sand.

The minor soils are poorly drained Acredale, Duckston, Nimmo, and Tomotley soils; somewhat poorly drained Augusta and Dragston soils; and moderately well drained to somewhat poorly drained Corolla soils. These soils are on ridges and nearly level transitional areas near uplands.

This map unit has little suitability for most uses other than as wetland wildlife habitat and for woodland. Flooding is the main limitation.

Areas dominated mostly by very poorly drained to excessively drained, sandy soils; in coastal areas

The map units in this group contain soils that formed in sandy, marine or eolian deposits or in organic material. The sandy soils are excessively drained to poorly drained, and the organic soils have sandy substratum and are very poorly drained.

7. Newhan-Duckston-Corolla

Excessively drained to poorly drained soils that have a sandy substratum; formed in marine and eolian sediments

This map unit consists of nearly level to steep, very rapidly permeable soils on grass- and shrub-covered sand dunes, flats, and depressions along coastal areas of the Atlantic Ocean and the Chesapeake Bay. Slopes range from 0 to 30 percent. The unit makes up about 5 percent of the survey area. Newhan soils make up about 27 percent of the map unit, Duckston soils about 20 percent, Corolla soils about 16 percent, and soils of minor extent about 37 percent.

The Newhan soils are on undulating to steep coastal dunes. They have a surface layer and substratum of fine sand. They are excessively drained.

The Duckston soils are on nearly level flats and in shallow depressions between coastal dunes. They have a surface layer of fine sand and a substratum of sand. They are poorly drained and are flooded in some areas after heavy rainfall and by overwash by saltwater.

The Corolla soils are on low, undulating coastal dunes and on flats. They have a surface layer and substratum of fine sand. They are somewhat poorly drained to moderately well drained.

The minor soils of this map unit are Beaches, Psamments, and very poorly drained Backbay soils. The Backbay soils are in broad, flat, frequently flooded marshes. Beaches are adjacent to the ocean and bay and are covered twice daily by saltwater. Psamments are sandy materials that have been disturbed by excavation, grading, or filling.

Most areas of this map unit are covered by salt-tolerant grasses and shrubs. Many areas are in their natural state, and other areas are used as sites for recreation and cottages, or they are in community development. The salt spray in areas close to the ocean or bay causes sparse vegetation and poor stability. The areas farther inland have more vegetation and are more stable. The major limitations of this unit for community development are a seasonal high water table, the very rapid permeability, slope, and the instability of sparsely vegetated areas.

8. Pamlico-Fripp-Lakehurst Variant

Very poorly drained, excessively drained, and moderately well drained soils that are organic or sandy; formed in organic material or in marine or eolian sediments

This map unit consists of nearly level to steep, wooded soils in depressions and on sand dunes in the northeastern corner of the City. Slopes range from 0 to 30 percent. The map unit makes up about 3 percent of the survey area. Pamlico soils make up about 30 percent of this map unit, Fripp soils about 15 percent, Lakehurst

Variant soils about 11 percent, and soils of minor extent about 44 percent.

The Pamlico soils are in depressions between relic sand dunes. They have a surface layer of partially decomposed organic material and layers of highly decomposed organic material underlain by sand. They are very poorly drained, have moderate permeability, and usually have water on the surface.

The Fripp soils are on undulating to steep relic sand dunes. The upper part of the surface layer is sand, and the lower part is fine sand. The subsoil and substratum are fine sand. The soils are excessively drained and have very rapid permeability.

The Lakehurst Variant soils are on low-lying relic sand dunes and toe slopes. The soils are sand throughout. They are moderately well drained and have very rapid permeability.

The minor soils of this map unit are excessively drained Newhan soils and very poorly drained Rappahannock soils. The Newhan soils are on sparsely vegetated and unstable sand dunes. The Rappahannock soils are in low marshes that are flooded daily by saltwater.

Most areas of this map unit are wooded. A few areas are used for recreation or community development. The major limitations of this map unit for community development are water on the surface, slope, and very rapid permeability.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, State loam, 2 to 6 percent slopes, is one of two phases in the State series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Newhan-Corolla fine sands, 0 to 15 percent slopes, is an example of a complex.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Beaches is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1—Acredale silt loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats. The areas of this soil commonly are oval or irregular in shape and range from 2 to 4,000 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is grayish brown silt loam about 7 inches thick. The subsoil is 43 inches thick. It is mainly gray silt loam and silty clay loam with yellowish brown mottles. The substratum is mottled gray and yellowish brown fine sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Chapanoke soils, poorly drained Nimmo and Tomotley soils, and very poorly drained Hyde, Nawney, and Portsmouth soils. The Augusta and Chapanoke soils are on slightly higher elevations and in undulating areas adjacent to creeks, rivers, and drainageways. The Hyde, Nawney, and Portsmouth soils are in slight depressions. The Nimmo and Tomotley soils are on broad flats. Also included are areas that have water ponded on the surface after heavy rains or during prolonged wet periods. A few small areas mostly in the northern part of the City and east of Oceana Ridge have a subsoil that extends to a depth of more than 60 inches. Included soils make up about 15 percent of the unit.

The permeability of this Acredale soil is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair, and the soil dries slowly. The subsoil has a moderate shrink-swell

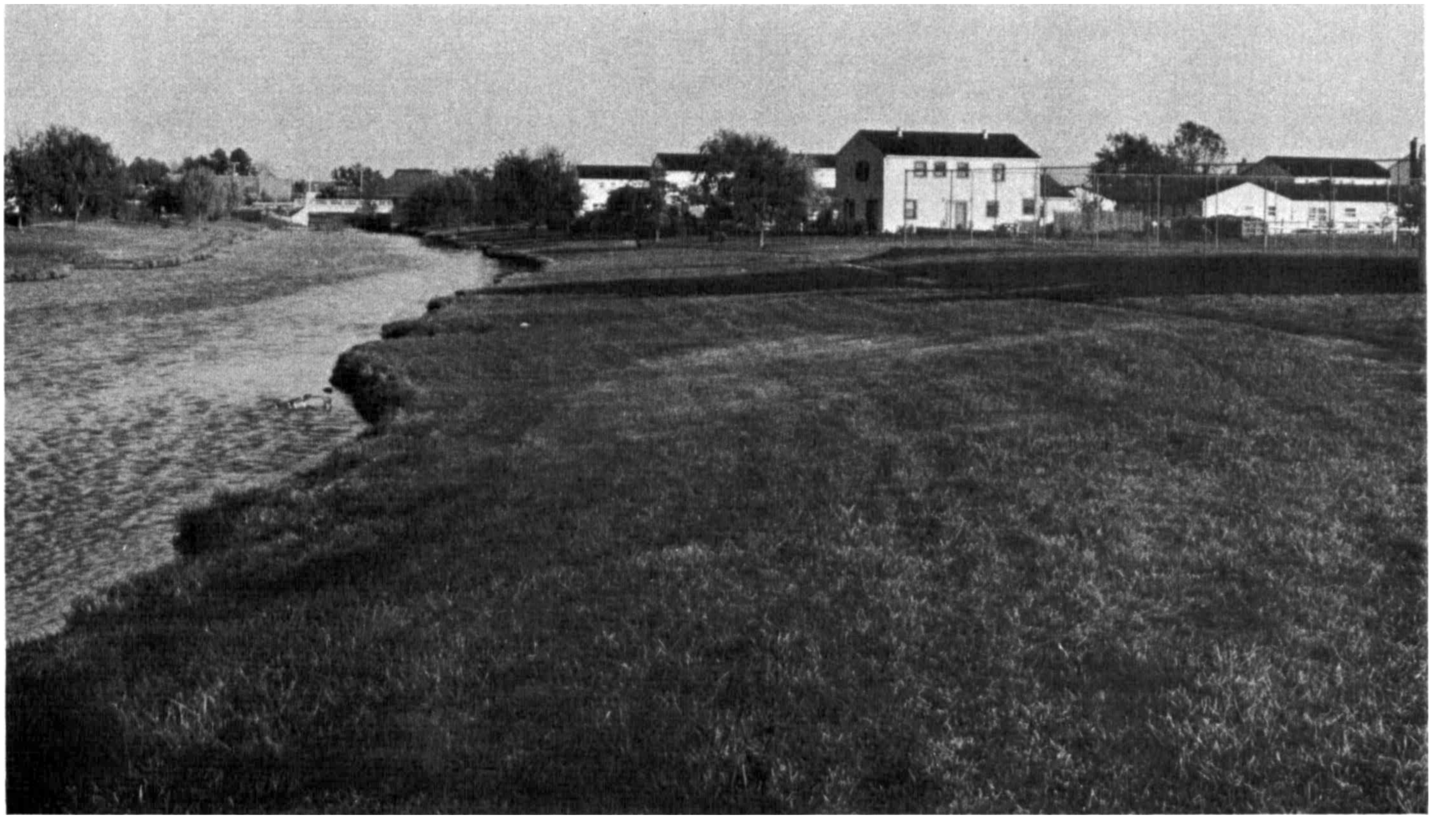


Figure 1.—Community development on an area of Acredale silt loam near a canal.

potential. The root zone extends to a depth of 60 inches or more. The surface layer mainly ranges from extremely acid through strongly acid, but the reaction varies because of local liming practices. The subsoil and substratum range from very strongly acid through neutral. The soil is moderate in organic matter content and medium in natural fertility. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are used for community development or woodland (fig. 1).

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, oaks, and sweetgum. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIIw.

2—Acredale-Urban land complex. This unit consists of deep, poorly drained soils and areas covered by parking lots, buildings, and other structures. The areas are on broad inland flats, commonly are irregularly shaped, and range from 2 to 1,000 acres. The unit is about 40 percent Acredale soils, 35 percent urbanized areas, and 25 percent other soils. The soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Acredale soils is grayish brown silt loam about 7 inches thick. The subsoil is 43 inches thick. It mainly is gray silt loam and silty clay loam with yellowish brown mottles. The substratum is mottled gray and yellowish brown fine sandy loam to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, poorly drained Tomotley soils, and somewhat poorly drained Augusta and Chapanoke soils. The Tomotley soils are nearly level. The Augusta and Chapanoke soils are at slightly higher elevations. The Udorthents are on nearly level areas that have been disturbed by grading, excavating, or filling.

The permeability of these Acredale soils is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair, and the soil dries slowly. The subsoil has a moderate shrink-swell potential. The soil is moderate in organic matter content and medium in natural fertility. The surface layer ranges mainly from extremely acid through strongly acid, but the reaction varies because of local liming practices. The subsoil and substratum range from very strongly acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

The Acredale soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

This unit is not assigned to a capability subclass.

3—Augusta loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low inland ridges and side slopes. The areas of this soil commonly are long and irregular in shape and range from 2 to 150 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is light olive brown loam about 8 inches thick. The subsoil is 37 inches thick. The upper 10 inches is light yellowish brown loam and clay loam with yellowish brown and strong brown mottles. The lower 27 inches mostly is gray clay loam with brown mottles. The substratum is mottled brown and gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Dragston and Chapanoke soils, and poorly drained Acredale and Tomotley soils. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale and Tomotley soils are in slight depressions. The Chapanoke and Dragston soils are on low ridges and side slopes. Also included are areas of mainly undulating soils adjacent to lakes, bays, and large drainageways. The slopes of those soils range from 15 to 30 percent and are 20 to 50 feet long, and the soils generally have more sand and less clay in the subsoil than this Augusta soil. These areas are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Augusta soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard mainly is slight. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, yellow-poplar, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table is the main limitation of the unit for community development, especially as a site for septic tanks, buildings, roads and streets, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

The capability subclass is IIIw.

4—Augusta-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained Augusta soils and areas covered by parking lots, buildings, and other structures. The areas are on low inland ridges and side slopes, commonly are irregularly shaped, and range from 2 to 75 acres. The unit is about 40 percent Augusta soils, 35 percent urbanized areas, and 25 percent other soils. The soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Augusta soils is light olive brown loam about 8 inches thick. The subsoil is 37 inches thick. The upper 10 inches is light yellowish brown loam and clay loam with yellowish brown and strong brown mottles. The lower 27 inches mostly is gray clay loam with brown mottles. The substratum is mottled brown and gray loamy sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Chapanoke and Dragston soils, and poorly drained Acredale and Tomotley soils. The Udorthents are nearly level. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale and Tomotley soils are in slight depressions, and the Dragston soils are on low ridges and side slopes.

The permeability of these Augusta soils is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Augusta soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of the unit for community development, especially as a site for septic tanks, buildings, roads and streets, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

This unit is not assigned to a capability subclass.

5—Backbay mucky peat. This soil is deep, nearly level, and very poorly drained. It is in broad, brackish marshes adjacent to Back Bay. The areas of this soil commonly are irregularly shaped and range from 2 to 1,200 acres. Slopes are less than 1 percent.

Typically, the upper 11 inches of this soil is very dark brown partially decomposed organic material. The next 11 inches is black silt loam. The substratum extends to a depth of at least 60 inches. It mostly is gray sandy clay loam and silty clay loam with light olive brown mottles.

Included with this soil in mapping are small areas of poorly drained Duckston, Nimmo, and Tomotley soils and very poorly drained Nawney and Pocaty soils. The Nimmo, Tomotley, Nawney, and Duckston soils are at slightly higher elevations. The Pocaty soils are nearly level. Some included areas of this unit along the west side of the Outer Banks have stratified sand in the substratum. Some units that border coarser textured upland soils have a coarser textured substratum. Included soils make up about 20 percent of the unit.

The permeability of this Backbay soil is moderate or moderately slow. The available water capacity is high, but the water is brackish. Surface runoff is very slow. The substratum has a moderate shrink-swell potential. The soil commonly is very strongly acid through moderately acid in the organic surface layer and is strongly acid through neutral in the mineral layers. The soil is flooded by wind tides and is continuously saturated.

Most areas of this soil are in native marsh vegetation such as black needlerush, cattails, olney threesquare, and cordgrass.

The soil is limited for most uses other than as wildlife habitat. The major limitations for most uses are a year-round water table at the surface, low strength, flooding, and the organic matter on the surface.

The capability subclass is VIIIw.

6—Beaches. This unit consists of long, narrow areas adjacent to the Chesapeake Bay and the Atlantic Ocean. The areas consist mostly of sandy material deposited by wave action and that is flooded daily by tides. The areas range from 2 to 70 acres. Slopes range from 0 to 10 percent.

Included with this unit in mapping are small areas of Corolla and Newhan soils that are at higher elevations and that support salt-tolerant grasses and shrubs. Also included are areas that have a high content of gravel and shells. Included areas make up about 15 percent of the unit.

This unit is used mostly for recreation and wildlife habitat. Daily tidal flooding limits most other uses.

This unit is not assigned to a capability subclass.

7—Bojac fine sandy loam. This soil is deep, nearly level, and well drained. It is on low inland ridges and side slopes. The areas of this soil commonly are irregularly

shaped and range from 2 to 130 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark brown fine sandy loam about 8 inches thick. The subsoil is 30 inches thick. It is strong brown fine sandy loam and loam. The substratum mostly is brownish yellow and yellow loamy fine sand and fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained State soils and moderately well drained Munden and Tetotum soils. The State soils are on low ridges, and the Munden and Tetotum soils are in slight depressions. Also included are small areas adjacent to lakes, bays, and large drainageways that have slopes of 15 to 30 percent and that are 20 to 50 feet long. These areas mainly are undulating and are dissected by many short drainageways. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring, and some soils in the Bayville area have more coarse sand and gravel than this Bojac soil. Included soils make up about 15 percent of the unit.

The permeability of this Bojac soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The surface layer is very friable and easily tilled. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in community development or woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, stubble mulching, and using crop residue are practices that help to maintain organic matter content and tilth, reduce erosion and crop damage, and improve moisture in the soil. Tilling within the proper range of moisture content reduces soil compaction and clodding.

The potential productivity for trees on this soil is moderately high, especially for oaks, loblolly pine, and sweetgum. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this soil for community development, especially for septic tank absorption fields. In some areas drainage is needed to help overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. In areas used as sites for septic tanks, the permeability causes a hazard of contamination to water.

The capability class is I.

8—Chapanoke silt loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low inland ridges and on side slopes that border major drainageways. The areas commonly are irregular in shape or long and narrow and range from 2 to 130 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is light brownish gray silt loam about 3 inches thick. The subsoil is 43 inches thick. The upper part is olive yellow silt loam and silty clay loam with brown and gray mottles. The lower part is mottled, gray silty clay loam and silty clay. The substratum mostly is mottled, light yellowish brown silt loam and fine sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Augusta soils, poorly drained Acredale soils, and other somewhat poorly drained soils that have slow permeability. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale soils are in small depressions, and the Augusta soils are on low ridges and side slopes. Also included are areas of mainly undulating soils adjacent to lakes, bays, and large drainageways. The slopes of these soils range from 15 to 30 percent and are 20 to 50 feet long, and the soils generally have more sand and less clay in the subsoil than this Chapanoke soil. These areas are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Chapanoke soil is moderately slow in the subsoil and moderate in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. Tilth is fair, and the soil dries slowly. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid through moderately acid, but reaction of the surface layer varies because of local liming practices. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are in community development or woodland. Some areas are used for cultivated crops.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper soil moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing

vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIw.

9—Chapanoke-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on low, inland ridges and on side slopes that border major drainageways. The areas commonly are irregular in shape or long and narrow and range from 3 to 120 acres. They are about 40 percent Chapanoke soils, 35 percent urbanized areas, and 25 percent other soils. The Chapanoke soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Chapanoke soils is light brownish gray silt loam about 3 inches thick. The subsoil is 43 inches thick. The upper part is olive yellow silt loam and silty clay loam with brown and gray mottles. The lower part is mottled, gray silty clay loam and silty clay. The substratum mostly is mottled, light yellowish brown silt loam and fine sandy loam to a depth of at least 60 inches.

Included with this complex in mapping are areas of Udorthents, moderately well drained Tetotum and Yeopim soils, somewhat poorly drained Augusta soils, poorly drained Acredale soils, and other somewhat poorly drained soils that have slow permeability. The Udorthents are nearly level. The Tetotum and Yeopim soils are at slightly higher elevations. The Acredale soils are in small depressions and the Augusta soils are on low ridges and side slopes.

The permeability of the Chapanoke soils is moderately slow in the subsoil and moderate in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. Tilth is fair, and the soil dries slowly. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid to moderately acid, but reaction of the surface layer varies because of local liming practices. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Chapanoke soils in this unit are used mostly for lawns, gardens, and parks.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

This unit is not assigned to a capability subclass.

10—Corolla fine sand. This soil is deep, nearly level to gently sloping, and moderately well drained to somewhat poorly drained. It is on low coastal dunes and flats. The areas of this soil commonly are irregularly shaped and range from 2 to 275 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer of this soil is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches of the substratum is pale brown fine sand. The lower part is pale brown, mottled fine sand and grayish brown sand.

Included with this soil in mapping are small areas of excessively drained Newhan soils and poorly drained Duckston soils. The Newhan soils are at higher elevations, and the Duckston soils are in depressions. Included soils make up about 20 percent of the unit.

The permeability of this Corolla soil is very rapid. Available water capacity is very low. Surface runoff is slow. The wind erosion hazard is moderate. The soil has a low shrink-swell potential. It is low in natural fertility and organic matter content. It commonly ranges from extremely acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is at a depth of 1 foot to 3 feet, mainly during winter and spring.

Most areas of this soil are in native grasses and shrubs. Some areas are used as sites for beach cottages and recreation.

This soil is poorly suited to farming because of low natural fertility, very low available moisture, and blowing sand. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. The areas adjacent to the coastline support only salt-tolerant plants such as American beachgrass, marshhay cordgrass, and northern bayberry. The plants mainly are sparse in these areas, and thus

the soil is susceptible to wind and water erosion. The areas farther from the effects of the salt spray support a larger variety of herbaceous plants and trees such as loblolly pine, live oak, and maple, though potential productivity for trees is low. These inland areas are less susceptible to wind and water erosion and generally are more stabilized.

The seasonal high water table and the very rapid permeability are the main limitations of this unit for community development. The seasonal high water table limits use of the soil as a site for buildings or roads; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soil for septic tank absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

The capability subclass is VIIs.

11—Corolla-Duckston fine sands. This unit consists of deep, nearly level to gently sloping soils in coastal areas. The Corolla soils are on low, undulating coastal dunes and flats. The Duckston soils are on low flats and in shallow depressions between the dunes. The areas commonly are irregularly shaped and range from 3 to 75 acres. They are about 45 percent moderately well drained to somewhat poorly drained Corolla soils, 35 percent poorly drained Duckston soils, and 20 percent other soils. The Corolla and Duckston soils are so intermingled that it was not practical to map them separately. Slopes range from 0 to 4 percent on the Corolla soils and from 0 to 2 percent on the Duckston soils.

Typically, the surface layer of the Corolla soils is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches of the substratum is pale brown fine sand. The lower part is mottled, pale brown fine sand and grayish brown sand.

Typically, the surface layer of the Duckston soils is dark grayish brown fine sand about 4 inches thick. The substratum is grayish brown and gray sand to a depth of at least 60 inches.

Included with this complex in mapping are small areas of Psamments and excessively drained Newhan soils. The Newhan soils are at higher elevations, and the Psamments are nearly level.

The permeability of these Corolla and the Duckston soils is very rapid. Both soils have very low available water capacity. Surface runoff is slow. Both soils are low in natural fertility and organic matter content. The soils commonly range from extremely acid through neutral. A seasonal high water table during winter and spring is at a depth of 1 foot to 3 feet in the Corolla soils and is between the surface and a depth of 1 foot in the Duckston soils. The Duckston soils are frequently flooded throughout most of the year.

Most areas of these soils are in native grasses and shrubs. Some areas are used as sites for beach cottages and recreation.

The soils of this unit are poorly suited to most types of farming because of wetness, blowing sand, and low natural fertility. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as American beachgrass, marshhay cordgrass, wax myrtle, and northern bayberry. The plants mainly are sparse on these areas, and thus the soils are susceptible to wind and water erosion. The Duckston soils usually have a denser stand of grasses and shrubs. The areas of this unit that are farther from the effects of salt spray support a larger variety of plants and trees such as loblolly pine, live oak, and maple, though potential productivity for trees is low. These inland areas are less susceptible to wind and water erosion and generally are more stabilized.

The seasonal high water table and very rapid permeability of the unit and the hazard of flooding on the Duckston soils are the main limitations of this unit for community development. The water table limits the soils as a site for buildings or roads and streets; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soils as a site for septic tank absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as sites for septic tanks.

The capability subclass is VIIw.

12—Dorovan mucky peat. This soil is deep, nearly level, and very poorly drained. It is in swamps adjacent to major rivers and their tributaries. Most areas of this soil are in the vicinity of the North Landing River. The areas commonly are irregularly shaped and range from 3 to 1,300 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is dark brown partially decomposed organic material about 4 inches thick. The subsurface layers mostly are dark brown highly decomposed organic material 74 inches thick. The substratum is dark gray silt to a depth of at least 80 inches.

Included with this soil in mapping are small areas of very poorly drained Nawney and Pocaty soils. The Nawney soils are at slightly higher elevations, and the Pocaty soils are at lower elevations. Also included are small areas of soils that have a thinner organic surface layer than this Dorovan soil. These areas are between Dorovan soils and upland mineral soils. Included soils make up about 25 percent of the unit.

The permeability of this Dorovan soil is moderate. The available water capacity is very high. Surface runoff is very slow. The shrink-swell potential is low. The soil ranges from extremely acid through slightly acid. It is flooded frequently by wind tides and is continuously saturated.

This soil is limited for most types of farm and nonfarm uses by wetness, low strength, flooding, and the high organic matter content. Most areas are wooded, and the potential productivity for trees is moderate, especially for water-tolerant species such as baldcypress, blackgum, and water tupelo. A few loblolly pine are in some areas. Wetness and low strength of the organic material severely limit timber management and harvesting and limit the soil for most uses other than as wetland wildlife habitat.

The capability subclass is VIIw.

13—Dragston fine sandy loam. This soil is deep, nearly level, and somewhat poorly drained. It is on low ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 170 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sandy loam about 9 inches thick. The subsoil is sandy loam 29 inches thick. The upper part mostly is light yellowish brown; the lower part is mottled brown, gray, and red. The substratum is mottled, light gray sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Munden and Tetotum soils, somewhat poorly drained Augusta soils, and poorly drained Nimmo and Tomotley soils. The Munden and Tetotum soils are at slightly higher elevations. The Nimmo and Tomotley soils are in slight depressions, and the Augusta soils are on low ridges and side slopes. Included soils make up about 15 percent of the unit.

The permeability of this Dragston soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in community development or woodland.

Drained areas of this soil are well suited to cultivated crops. Drainage systems are difficult to install, however, because of the wet, sandy substratum. The soil sometimes is droughty during the growing season, and crop response to lime and fertilizer is limited by the available water capacity. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, hold moisture in the soil, and reduce crusting.

The potential productivity for trees on the soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this unit for community development, especially for septic tank absorption fields and building sites. Drainage helps to improve the suitability of the soil as a site for septic tanks, but the design and installation of septic tanks must meet State and local criteria. In areas used as sites for septic tanks, the rapid permeability causes a hazard of contamination to water. Drainage and landscaping will help to improve the suitability of the soil as a building site.

The capability subclass is IIw.

14—Dragston-Urban land complex. This unit consists of deep, nearly level, somewhat poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on low ridges and side slopes. The areas are irregularly shaped and range from 2 to 30 acres. They are about 40 percent Dragston soils, 35 percent urbanized areas, and 25 percent other soils. The Dragston soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Dragston soil is dark grayish brown fine sandy loam about 9 inches thick. The subsoil is sandy loam 29 inches thick. The upper part mostly is light yellowish brown; the lower part is mottled brown, gray, and red. The substratum is mottled, light gray sandy loam to a depth of at least 60 inches.

Included with this unit in mapping are small areas of Udorthents, moderately well drained Munden and Tetotum soils, somewhat poorly drained Augusta soils, and poorly drained Nimmo and Tomotley soils. The Munden and Tetotum soils are at slightly higher elevations, and the Nimmo and Tomotley soils are in slight depressions. The Augusta soils are on low ridges and side slopes.

The permeability of these Dragston soils is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high

water table is at a depth of 1 foot to 1-1/2 feet during winter and spring.

The Dragston soils in this unit are used mainly for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability of the substratum are the main limitations of this unit for community development, especially for septic tank absorption fields and building sites. Drainage helps to improve the suitability of the soil as a site for septic tanks, but the design and installation of septic tanks must meet State and local criteria. In areas used as sites for septic tanks, the rapid permeability causes a hazard of contamination to water. Drainage and landscaping will help to improve the suitability of the soil as a building site.

This unit is not assigned to a capability subclass.

15—Duckston fine sand. This soil is deep, nearly level, and poorly drained. It is in shallow depressions between dunes and on low flats between the dunes and the marshes. The areas of this soil commonly are irregularly shaped and range from 2 to 230 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown fine sand about 4 inches thick. The substratum is grayish brown and gray sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of very poorly drained Backbay soils and moderately well drained to somewhat poorly drained Corolla soils. The Backbay soils are at lower elevations, and the Corolla soils are at higher elevations. Also included are areas that have water on the surface after heavy rainfall or during prolonged wet periods and a few areas that are adjacent to marshes and that have an organic surface layer. Included soils make up about 20 percent of the unit.

The permeability of this Duckston soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is slight. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through neutral. The root zone extends to a depth of 60 inches or more. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring. This soil is frequently flooded during most of the year.

This soil is very poorly suited to farming because of wetness, low natural fertility, and blowing sand from adjacent areas. Most areas of this soil are in native grasses and shrubs. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as marshhay cordgrass, northern bayberry, and bulrush. The areas farther from the effects of salt spray support a larger variety and denser stands of herbaceous plants.

Trees such as loblolly pine, red bay, red maple, sweet gum, and water oak are on areas adjacent to marshes, but the potential productivity is low. Only a few included areas support stands of merchantable loblolly pine. Wetness limits the use of heavy equipment.

Flooding, the seasonal high water table, and the sandy texture of the substratum are the main limitations of this soil for community development. Flooding and the seasonal high water table limit use of the soil as a site for septic tank absorption fields, buildings, and roads. The seasonal high water table and the instability of the substratum limit excavations.

The capability subclass is VIIw.

16E—Fripp sand, 2 to 30 percent slopes. This soil is deep, undulating to steep, and excessively drained. It is on the high wooded coastal dunes of the Cape Henry area. The areas of the soil commonly are long and narrow and range from 2 to 400 acres.

Typically, the surface layer of this soil is dark grayish brown sand about 5 inches thick. The subsurface layer is light brownish gray fine sand 7 inches thick. The subsoil is mottled, brown and yellowish brown fine sand 8 inches thick. The substratum is brownish yellow and very pale brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Lakehurst Variant soils, excessively drained Newhan soils, and very poorly drained Pamlico soils. The Lakehurst Variant soils are on low dunes. The Pamlico soils are in depressions, and the Newhan soils are undulating. Included soils make up about 15 percent of the unit.

The permeability of this Fripp soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly is extremely acid or very strongly acid.

Most areas of this soil are in woodland. A few areas are used for recreation.

Slope in some areas and the very low available water capacity make this soil generally unsuitable for farming. The potential productivity for trees on this soil is moderate, especially for species such as loblolly pine and oaks. The very low available water capacity limits seedling growth and survival, and slope limits the use of timber equipment.

The very rapid permeability and slope are the main limitations of this soil for community development. Slope limits the use of the soil as a site for roads, buildings, and excavations. The permeability causes a hazard of contamination to water supplies in areas used as sites for septic tanks, and the design and installation of septic tanks must meet State and local criteria.

The capability subclass is VIIs.

17—Hyde silt loam. This soil is deep, nearly level, and very poorly drained. It is on broad flats and in slight depressions. The areas of this soil commonly are long and narrow and range from 2 to 120 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silt loam about 16 inches thick. The subsoil mostly is mottled, grayish brown and olive gray silty clay loam and silty clay 42 inches thick. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils and very poorly drained Portsmouth soils. The Acredale, Nimmo, and Tomotley soils are at slightly higher elevations. The Portsmouth soils are nearly level. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 15 percent of the unit.

The permeability of this Hyde soil is slow in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. Tilth is fair. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is medium in natural fertility, and the surface layer is high in organic matter content. The soil mainly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1/2 foot during wet seasons.

Most areas of this soil have been drained by ditching and are used for cultivated crops. Most of the remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rainfall. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for sycamore, yellow-poplar, sweetgum, oaks, and loblolly pine. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, and the use of heavy timber equipment is limited during periods of heavy rainfall and during wet seasons.

The seasonal high water table, the permeability in the subsoil, and low strength are the main limitations of this unit for community development. The water table and permeability limit use of the soil as a site for septic tank absorption fields. Using drainage will help to overcome those limitations, but the design and installation of septic tanks must meet State and local criteria. The water table limits the soil as a building site and as a site for many types of recreation; using landscaping and drainage improves the suitability of the soil as a site for buildings or recreation. Strengthening or replacing the base material and installing drainage will help to overcome the water table and low strength if the soil is used as a site for roads and streets.

The capability subclass is IIIw.

18—Lakehurst Variant sand. This soil is deep, nearly level to undulating, and moderately well drained. It is on the low, wooded dunes and toe slopes in the Cape Henry area. The areas of this soil commonly are long and narrow and range from 2 to 75 acres. Slopes range from 0 to 4 percent.

Typically, the surface layer of this soil is dark grayish brown sand about 4 inches thick. The subsurface layer is light brownish gray sand 20 inches thick. The subsoil is dark reddish brown sand 8 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled, yellowish brown sand in the upper part and mostly mottled yellowish brown, dark reddish brown, and yellowish red sand in the lower part.

Included with this soil in mapping are small areas of excessively drained Fripp and Newhan soils and very poorly drained Pamlico soils. The Fripp and Newhan soils are at higher elevations, and the Pamlico soils are in depressions. Included soils make up about 15 percent of the unit.

The permeability of this Lakehurst Variant soil is very rapid, and available water capacity is very low. Surface runoff is slow. The erosion hazard is slight. The soil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil has low organic matter content and natural fertility. It commonly is extremely acid or very strongly acid. A seasonal high water table is at a depth of 1-1/2 to 3 feet during winter and spring.

Most areas of this soil are in woodland. A few areas are used for recreation.

This soil is poorly suited to cultivated crops because of the very low moisture holding capacity, undulating slopes, and low natural fertility.

The potential productivity for trees on this soil is moderate, especially for loblolly pine and oaks and some other hardwoods. The very low moisture holding capacity limits seedling growth and survival. The low, narrow dunes and the adjacent wet soils commonly limit the use of heavy equipment.

The seasonal high water table and the very rapid permeability are the main limitations of this unit for community development. The seasonal high water table limits use of the soil as a site for buildings or roads; however, proper design and grading and addition of a base material will help to overcome this limitation. Using drainage helps the suitability of the soil for septic tank

absorption fields, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

The capability subclass is VIIs.

19—Munden fine sandy loam. This soil is deep, nearly level, and moderately well drained. It is on low inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 200 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this Munden soil is dark grayish brown fine sandy loam about 8 inches thick. The subsoil is 24 inches thick. It is yellowish brown sandy loam in the upper part and mottled, yellowish brown and brown loam and sandy loam in the lower part. The substratum is mottled brown, gray, and red sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Dragston soils. The Bojac and State soils are at slightly higher elevations, and the Augusta and Dragston soils are in slight depressions. The Tetotum soils are on low ridges and side slopes. Also included are undulating areas that have slopes of 15 to 30 percent that are 20 to 50 feet long. These areas are adjacent to lakes, bays, and large drainageways and are dissected by many short drainageways. Included soils make up about 15 percent of the unit.

The permeability of this Munden soil is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It mainly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. The remaining areas are in woodland or community development.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration. Tilling within the proper range of moisture content helps to reduce soil compaction and clodding.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tank absorption fields must meet State and local criteria. In areas used as a site for septic tanks, the permeability causes a hazard of contamination to water.

The capability subclass is IIw.

20—Munden-Urban land complex. This complex consists of deep, nearly level, moderately well drained soils and areas covered by buildings, parking lots, and other structures. The unit is on low inland ridges and side slopes. The areas commonly are irregularly shaped and range from 2 to 80 acres. They are about 40 percent Munden soils, 35 percent urbanized areas, and 25 percent other soils. The Munden soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of this Munden soil is dark grayish brown fine sandy loam about 8 inches thick. The subsoil is 24 inches thick. It is yellowish brown sandy loam in the upper part and mottled, yellowish brown and brown loam and sandy loam in the lower part. The substratum is mottled brown, gray, and red sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of Udorthents, well drained Bojac and State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Dragston soils. The Udorthents are nearly level. The Bojac and State soils are at slightly higher elevations, and the Augusta and Dragston soils are in slight depressions. The Tetotum soils are on low ridges and side slopes.

The permeability of the Munden soils is moderately rapid in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It mainly is very strongly acid through moderately acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

The Munden soils in this unit are used mostly for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tank absorption fields must meet State and

local criteria. In areas used as a site for septic tanks, the permeability causes a hazard of contamination to water.

This unit is not assigned to a capability subclass.

21—Nawney silt loam. This soil is deep, nearly level, and very poorly drained. It is on flood plains and in drainageways. The areas commonly are long and narrow or irregular in shape and range from 2 to 500 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is dark gray silt loam about 5 inches thick. The substratum extends to a depth of 60 inches or more. It is gray loam to a depth of 44 inches and gray loamy sand at a depth of more than 44 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils; very poorly drained Backbay, Dorovan, Portsmouth, and Rappahannock soils; and areas near the Dorovan soils that have an organic surface layer more than 8 inches thick. The Backbay and Rappahannock soils are at low elevations, and the Dorovan soils are in depressions. The other included soils are at slightly higher elevations. Included soils make up about 25 percent of the unit.

The permeability of this Nawney soil is moderate. Available water capacity is moderate. Surface runoff is very slow. The substratum has a moderate shrink-swell potential. The root zone extends to a depth of 60 inches or more but is restricted for some plants by the seasonal high water table. The soil is low in natural fertility, and the surface layer has moderate organic matter content. The soil ranges from extremely acid through strongly acid above a depth of 40 inches and from extremely acid through slightly acid below 40 inches. The water table is between the surface and a depth of 1/2 foot throughout most of the year, and the soil is frequently flooded, especially from late fall through late spring.

Flooding and the water table make this soil generally unsuited to most uses other than woodland and wildlife habitat, and most areas are in woodland. The potential productivity for trees on this soil is moderate. The common trees are water-tolerant baldcypress, water tupelo, sweetgum, and red maple. The rate of seedling mortality is high for most other species. The seasonal high water table causes roots to grow close to the surface, thus increasing the hazard of uprooting during windy periods. Wetness and flooding limit the use of heavy equipment.

The capability subclass is VIIw.

22E—Newhan fine sand, 2 to 30 percent slopes. This soil is deep, undulating to steep, and excessively drained. It is on grass- and shrub-covered high sand dunes in coastal areas (fig. 2). The areas of this soil commonly are long and narrow or irregular in shape and range from 2 to 250 acres.

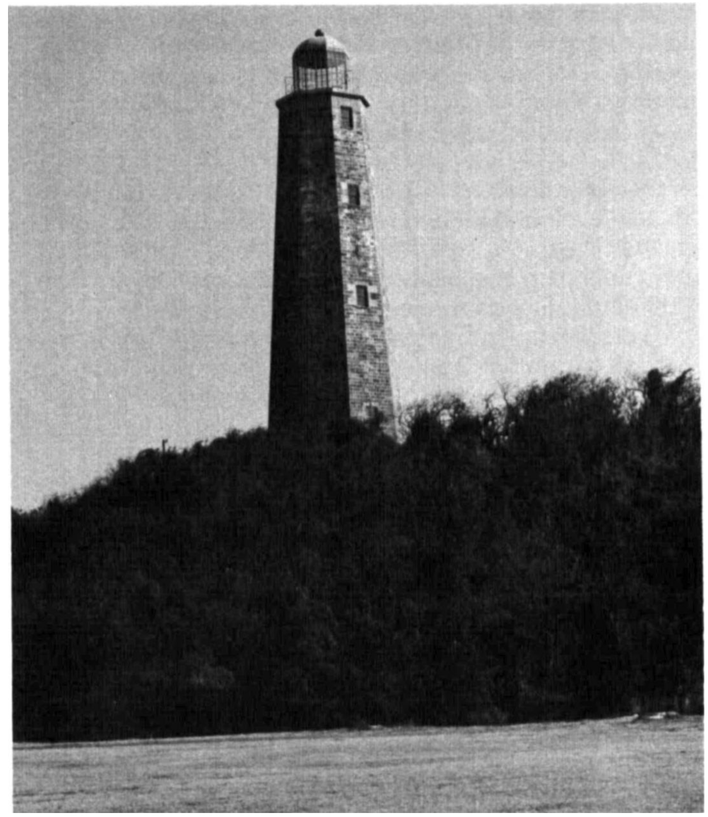


Figure 2.—Cape Henry lighthouse on a dune of Newhan fine sand, 2 to 30 percent slopes.

Typically, the surface layer of this soil is grayish brown fine sand about 3 inches thick. The substratum is very pale brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Duckston soils, moderately well drained to somewhat poorly drained Corolla soils, and beaches. The Corolla and Duckston soils are at lower elevations. Included soils make up about 20 percent of the unit.

The permeability of this Newhan soil is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe. The soil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges from extremely acid through neutral.

Some areas of this soil are used as sites for cottages and recreation, but the soil is poorly suited for most other uses because of the low natural fertility, very low available moisture holding capacity, slopes, and blowing sand. The dominant vegetation depends upon the proximity of the unit to the Atlantic Ocean or the

Chesapeake Bay. Areas adjacent to the coastline support only salt-tolerant plants such as sea-oats, American beachgrass, coastal panicgrass, and beach heather. This vegetation mainly is sparse in these areas, and thus the soil is susceptible to wind and water erosion. The areas that are farther from the effects of salt spray support a larger variety and denser stand of grasses and shrubby trees and are less susceptible to wind erosion. The dominant species are loblolly pine and live oak, but the potential productivity is low.

The permeability and slope are the main limitations of this soil for community development. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks. Slope limits the soil as a site for roads, buildings, and excavations.

The capability subclass is VIIIs.

23C—Newhan-Corolla fine sands, 0 to 15 percent slopes. This unit consists of deep soils in coastal areas, mostly behind the primary foredune. The Newhan soils are excessively drained and are on low sand dunes, and the Corolla soils are moderately well drained to somewhat poorly drained and are on flats and low knolls. The areas of this unit are irregularly shaped and range from 2 to 160 acres. They are about 55 percent undulating to rolling Newhan soils, 35 percent nearly level to undulating Corolla soils, and 10 percent other soils. The Newhan and Corolla soils are so intermingled that it was not practical to map them separately. Slopes range from 0 to 6 percent on the Corolla soils and from 2 to 15 percent on the Newhan soils.

Typically, the surface layer of the Newhan soils is grayish brown fine sand about 3 inches thick. The substratum is very pale brown fine sand to a depth of at least 60 inches.

Typically, the surface layer of the Corolla soils is dark grayish brown fine sand about 3 inches thick. The substratum extends to a depth of 60 inches or more. The upper 15 inches is pale brown fine sand. The lower part is mottled, pale brown fine sand and grayish brown sand.

Included with this unit in mapping are small areas of Psamments and poorly drained Duckston soils. The Psamments are nearly level, and the Duckston soils are in depressions.

The permeability of these Newhan and the Corolla soils is very rapid. Both soils have very low available water capacity. Surface runoff is slow. The wind erosion hazard is severe on the Newhan soils and moderate on the Corolla soils. Both soils have a low shrink-swell potential, and the root zone extends to a depth of 60 inches or more in both. The soils are low in organic matter content and natural fertility. They commonly range from extremely acid through neutral. A seasonal high water table is at a depth of 1 foot to 3 feet in Corolla soils, mostly during winter and spring.

Some areas of this unit are used for cottages and recreation, but blowing sand, salt spray, and low natural fertility make the soil generally unsuitable for most other uses.

Most areas of this unit are in natural grasses and shrubs. The vegetation mostly is sparse stands of salt-tolerant plants such as American beachgrass, sea-oats, marshhay cordgrass, northern bayberry, and waxmyrtle. The Newhan soils are sparsely vegetated and are especially susceptible to wind erosion.

The seasonal high water table of the Corolla soils, the very rapid permeability of the Newhan and Corolla soils, and the slope of Newhan soils are the main limitations of this unit for community development. They especially limit the soils as a site for buildings, septic tank absorption fields, or roads. Special design, grading, and addition of base material will help to overcome the limitations for building sites and roads. Drainage helps to improve the suitability of the soil as a site for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria and the rapid permeability causes a hazard of water contamination in areas used as sites for septic tanks. Wind erosion is a further limitation for building sites and roads, and the use of a plant cover to stabilize the sand is needed in some areas.

The capability subclass is VIIIs.

24—Nimmo loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats. The areas of this soil commonly are oval or irregularly shaped and range from 2 to 1,200 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark gray loam about 7 inches thick. The subsoil is 26 inches thick. It mostly is light gray and gray fine sandy loam and loam with yellowish brown mottles. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Tomotley soils, and very poorly drained Portsmouth and Nawney soils. The Dragston and Augusta soils are at slightly higher elevations. The Nawney soils are in drainageways, and the Portsmouth soils are in depressions. Also included are soils that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 15 percent of the unit.

The permeability of this Nimmo soil is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high

water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are in woodland or community development.

Drained areas of this soil are well suited to cultivated crops, but drainage systems are difficult to install in some areas because of the wet, sandy substratum. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sycamore, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy equipment.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability subclass is IIIw.

25—Nimmo-Urban land complex. This unit consists of deep, nearly level, poorly drained soils and areas covered by parking lots, buildings, and other structures. The unit is on broad inland flats. The areas commonly are irregularly shaped and range from 2 to 570 acres. They are about 40 percent Nimmo soils, 35 percent urbanized areas, and 25 percent other soils. The Nimmo soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Nimmo soils is dark gray loam about 7 inches thick. The subsoil is 26 inches thick. It mostly is light gray and gray fine sandy loam and loam with yellowish brown mottles. The substratum is light gray fine sand to a depth of at least 60 inches.

Included with this unit in mapping are small areas of Udorthents, somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Tomotley soils, and very poorly drained Portsmouth soils. The Augusta and Dragston soils are at slightly higher elevations, and the Portsmouth soils are in depressions. The Acredale and Tomotley soils and the Udorthents are nearly level.

The permeability of the Nimmo soils is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It ranges mainly from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

The Nimmo soils in this unit are mostly used for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water supplies in areas used as a site for septic tanks.

This unit is not assigned to a capability subclass.

26—Pamlico mucky peat, ponded. This soil is deep, nearly level, and very poorly drained. It is in depressions and troughs between wooded coastal dunes in the Cape Henry area. The areas of this soil commonly are long and narrow and range from 2 to 350 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark brown partially decomposed organic material about 6 inches thick over very dark brown highly decomposed organic material 24 inches thick. The substratum is dark grayish brown sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas on narrow ridges of excessively drained Fripp soils and moderately well drained Lakehurst Variant soils. Also included are small areas that consist of organic layers more than 51 inches thick. Included soils make up about 15 percent of the unit.

The permeability of this Pamlico soil is moderate or moderately rapid in the organic layers and rapid in the substratum. Available water capacity is very high. Surface runoff is very slow, and water is ponded on the surface of many areas. The shrink-swell potential is low. The soil is extremely acid in the organic layers and ranges from extremely acid through strongly acid in the substratum. A seasonal high water table is at or near the surface mostly during winter and spring.

The seasonal high water table and the high organic matter content make this soil generally unsuited to most uses other than as a wetland wildlife habitat. The potential productivity for trees on this soil is moderate, especially for water-tolerant species such as baldcypress and water tupelo. The rate of seedling mortality is high for all but those species. The seasonal high water table

causes roots to grow close to the surface, increasing the hazard of uprooting during windy periods. Wetness and water on the surface limit the use of heavy equipment.

The capability subclass is VIIw.

27—Pamlico-Lakehurst Variant complex. This unit is in the low, wooded swamps and on low dunes in the interior of the Cape Henry area. It mostly consists of nearly level Pamlico soils and nearly level to undulating Lakehurst Variant soils. The Pamlico soils are very poorly drained and deep and are in depressions and troughs. The Lakehurst Variant soils are moderately well drained and deep and are on low, narrow dunes and toe slopes. The areas of this unit are long and narrow and range from 5 to 1,200 acres. They are about 55 percent Pamlico soils, 35 percent Lakehurst Variant soils, and 10 percent other soils. The Pamlico and Lakehurst Variant soils are so intermingled that it was not practical to map them separately. Slopes are less than 1 percent on the Pamlico soils and range from 0 to 4 percent on the Lakehurst Variant soils.

Typically, the surface layer of the Pamlico soils is very dark brown partially decomposed organic material about 6 inches thick over very dark brown highly decomposed organic material 24 inches thick. The substratum is dark grayish brown sand to a depth of at least 60 inches.

Typically, the surface layer of the Lakehurst Variant soils is dark grayish brown sand about 4 inches thick. The subsurface layer is light brownish gray sand 20 inches thick. The subsoil is dark reddish brown sand 8 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled, yellowish brown sand in the upper part and mostly is mottled yellowish brown, dark reddish brown, and yellowish red sand in the lower part.

Included with this unit in mapping are small areas of excessively drained Fripp soils on high ridges.

The permeability of these Pamlico soils is moderate or moderately rapid in the organic layers and rapid in the substratum. Available water capacity is very high in the Pamlico soils. Surface runoff is very slow, and water is ponded on the surface of many areas. The erosion hazard is slight, and the shrink-swell potential is low. The root zone in the Pamlico soils extends generally to a depth of 60 inches or more but is restricted for some trees by a seasonal high water table that is at or near the surface mostly in winter and spring. The Pamlico soils have low natural fertility. They are extremely acid in the organic layers and range from extremely acid to strongly acid in the substratum.

The permeability of these Lakehurst Variant soils is very rapid, and available water capacity is very low. Surface runoff is slow. The erosion hazard is slight on the Lakehurst Variant soils, and the shrink-swell potential is low. The root zone extends generally to a depth of 60 inches or more but is restricted for some trees by a seasonal high water table at a depth of 1-1/2 to 3 feet. The Lakehurst Variant soils have low organic matter content, have low natural fertility, and are extremely acid or very strongly acid.

The seasonal high water table in both soils and the organic-matter content of the Pamlico soils limit this unit for most uses other than woodland, as wetland wildlife habitat, and for limited recreation. Most areas are wooded, and the potential productivity for trees is moderate. The Lakehurst Variant soils commonly support loblolly pine and oaks and other hardwoods. Water-tolerant species such as baldcypress and water tupelo mostly are on the Pamlico soils. Seasonal wetness especially limits the use of heavy equipment on this unit.

The capability subclass is VIIw.

28—Pocaty peat. This soil is deep, nearly level, and very poorly drained. It is in broad freshwater marshes that are mostly adjacent to the North Landing River and its major tributaries. The areas of this soil commonly are irregularly shaped and range from 2 to 1,000 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark brown partially decomposed organic material about 12 inches thick. The subsurface layer is dark brown, black, and dark gray highly decomposed organic material to a depth of 60 inches. The substratum is at a depth of more than 60 inches and is dark gray silt loam.

Included with this soil in mapping are small areas of Udorthents and very poorly drained Backbay, Dorovan, and Nawney soils. The Nawney soils are nearly level. The Backbay soils are mostly between the Pocaty soils and upland mineral soils, and the Dorovan soils are at a slightly higher elevation. The Udorthents are adjacent to waterways. Included soils make up about 15 percent of the unit.

The permeability of this Pocaty soil is moderate. Available water capacity is very high, but the water is brackish. Surface runoff is very slow. The shrink-swell potential is low. The soil ranges from very strongly acid through neutral, but upon drying or exposure to air it becomes extremely acid. The soil is frequently flooded by wind tides and is continuously saturated.

Most areas of this soil are in native grasses and sedges, mostly black needlerush, cattails, olney threesquare, and cordgrass. Low strength, flooding, and the high organic matter and sulfur content of this soil limit it for most uses other than as a wetland wildlife habitat.

The capability subclass is VIIIw.

29—Portsmouth loam. This soil is deep, nearly level, and very poorly drained. It is mostly on broad inland flats and in slight depressions. The areas of this soil commonly are irregularly shaped, but some areas are in circular depressions called Carolina Bays, which are mostly south of Creeds in the southern part of the City. The areas of this soil range from 2 to 400 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is very dark gray loam about 13 inches thick. The subsoil is 23 inches thick. It mostly is grayish brown silt loam in the upper part and dark brown and grayish brown sandy loam in the lower part. The substratum is mottled yellow, brown, and gray stratified sand, loamy sandy and sandy loam to a depth of at least 60 inches.

Included with this soil in mapping are small areas of poorly drained Acredale, Nimmo, and Tomotley soils; somewhat poorly drained Dragston soils; and very poorly drained Hyde soils. The Dragston soils are on low ridges and side slopes of the Carolina Bays. The Hyde soils are on flats, and in low depressions. The other soils are at slightly higher elevations. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods and soils that have less clay than this Portsmouth soil. Included soils make up about 15 percent of the unit.

The permeability of this Portsmouth soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is high. Surface runoff is very slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in natural fertility, and the surface layer is high in organic matter content. The soil commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1/2 foot mostly during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. Most of the remaining areas are in woodland.

Drained areas of this soil are well suited to cultivated crops. Drainage systems are difficult to install in some areas, however, because of the wet, sandy substratum and are limited in the Carolina Bays by the lack of suitable outlets. Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment during periods of heavy rainfall and during wet seasons.

The seasonal high water table is the main limitation of the soil for community development, especially as a site for septic tank absorption fields, excavations, buildings, and recreation. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria. The instability of the sandy substratum limits excavation.

The capability subclass is IIIw.

30—Psamments, undulating. This unit is mostly in coastal areas where sand dunes have been disturbed or where dredging operations occur. It consists of deep, well drained and moderately well drained sandy material that has been disturbed during excavation, filling, or grading. The areas of this unit commonly are irregularly shaped and range from 2 to 100 acres. Slopes range from 0 to 25 percent.

Included with this unit in mapping are small undisturbed areas of excessively drained Fripp and Newhan soils, moderately well drained Corolla and Lakehurst Variant soils, poorly drained Duckston soils, and soils that are not as well drained as Psamments. Many areas have nonsoil material, such as concrete, asphalt, wood, and glass. Included soils make up about 20 percent of the unit.

The permeability of this unit is very rapid. Available water capacity is very low. Surface runoff is slow. The erosion hazard is severe, especially on the steep parts with no plants. Reaction ranges from extremely acid through moderately acid. Most areas have a seasonal high water table about 1-1/2 feet from the surface mostly during winter and spring.

Some areas of this unit have been used as sites for roads and buildings. Onsite investigation is needed, however, to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

31—Psamments-Urban land complex. This unit consists of areas that have been disturbed by excavating, grading, or filling and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 150 acres. They are about 40 percent Psamments, 35 percent urbanized areas, and 25 percent other soils. Slopes range from 0 to 2 percent. The Psamments and urbanized areas are so intermingled that it was not practical to map them separately.

Included with this unit in mapping are small areas of excessively drained Fripp and Newhan soils and moderately well drained Corolla soils. Also included are some fill areas that have nonsoil material, such as concrete, wood, glass, and asphalt.

The permeability of the Psamments is very rapid. Available water capacity is low. Surface runoff is slow. The erosion hazard is slight. Reaction ranges from extremely acid through moderately acid. Most areas have a seasonal high water table at a depth of 1-1/2 feet.

Onsite investigation is needed to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

32—Rappahannock mucky peat, strongly saline. This soil is deep, nearly level, and very poorly drained. It is mostly in the northern part of the City in tidal marshes along creeks, rivers, and bays that are flooded daily with saltwater. Most areas are along the Elizabeth and Lynnhaven Rivers. The areas of this soil commonly are irregularly shaped and range from 2 to 50 acres. Slopes are less than 1 percent.

Typically, the surface layer of this soil is very dark grayish brown partially decomposed organic material about 11 inches thick. The subsurface layer is very dark grayish brown highly decomposed organic material 26 inches thick. The substratum extends to a depth of at least 80 inches. It is dark greenish gray silt loam in the upper part and black highly decomposed organic material in the lower part.

Included with this soil in mapping are small areas of very poorly drained Nawney and Pamlico soils. The Nawney soils are in drainageways. The Pamlico soils are in troughs and at the heads of drainageways. Some areas on Rudee Inlet have a very thin organic surface layer or a mineral surface layer that is underlain by semifluid silt or silt loam sediments. Also included are areas adjacent to the north side of Broad Bay that are underlain by sandy sediments. Included soils make up about 20 percent of the unit.

The permeability of this Rappahannock soil is moderate. Available water capacity is very high, but the water is saline. The shrink-swell potential is low. The soil ranges from neutral through moderately alkaline but becomes very strongly acid through moderately acid after exposure to air and when dry. The soil is flooded daily by tidal waters and is continuously saturated.

Most areas of this soil are in saltgrass, smooth cordgrass, and some black needlerush. The daily tidal flooding and the high organic matter content and high sulfur content limit this soil for most uses other than as wetland wildlife habitat.

The capability subclass is VIIIw.

33E—Rumford fine sandy loam, 6 to 35 percent slopes. This soil is deep, strongly sloping to steep, and well drained. It is on side slopes that border major lakes, bays, rivers, and drainageways mostly in the northern part of the City. The areas of this soil commonly are irregularly shaped and range from 3 to 500 acres. Slopes mostly range from 15 to 25 percent.

Typically, the surface layer of this soil is very dark grayish brown fine sandy loam about 3 inches thick. The subsurface layer is yellowish brown fine sandy loam 7 inches thick. The subsoil is 36 inches thick. It is strong brown sandy clay loam, fine sandy loam, and loamy fine sand. The substratum mostly is yellowish brown fine sand to a depth of at least 60 inches.

Included with this soil in mapping are small, nearly level areas of well drained Bojac and State soils, moderately well drained Tetotum and Yeopim soils, and Udorthents. Also included are soils that are similar to this Rumford soil but that have more clay or less clay in the subsoil or that do not have a well defined subsoil. Some areas have narrow drainageways and wet colluvial areas at the base of slopes, and seepage is common in some units on the lower part of the slopes. Some other areas that have a northeast exposure are severely eroded and unstable. Included soils make up about 25 percent of the unit.

The permeability of this Rumford soil is moderately rapid. Available water capacity is low. Surface runoff is medium to very rapid. The erosion hazard is moderate to severe. The shrink-swell potential is low. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid.

Most areas of this soil are in woodland. A few areas are used for community development.

The short, strongly sloping to steep slopes limit this soil for most types of farming. The potential productivity for trees is moderately high, especially for loblolly pine. Slope limits the use of equipment for woodland management and harvesting, and its use increases the erosion hazard.

Slope and seepage are the main limitations of this soil for community development, especially for building sites, for lawns and gardens, as a site for septic tank absorption fields, and for most types of recreation. The design and installation of septic tanks in this soil must meet State and local criteria. Slope stabilization and the prevention of erosion are main management concerns on areas of this soil that have had vegetation removed and on many areas that have a northeast exposure.

The capability subclass is VIe.

34A—State loam, 0 to 2 percent slopes. This soil is deep, nearly level, and well drained. It is on broad inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 750 acres.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and Rumford soils and moderately well drained Munden and Tetotum soils. The Bojac soils are on ridges and side slopes and the Munden and Tetotum soils are in slight depressions. The Rumford soils are strongly sloping to steep. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring. Included soils make up about 15 percent of the unit.

The permeability of this State soil is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are in community development or are used for cultivated crops. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is very high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. In some areas drainage is needed to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability class is I.

34B—State loam, 2 to 6 percent slopes. This soil is deep, gently sloping, and well drained. It is on inland ridges and side slopes. The areas of this soil commonly are irregularly shaped and range from 2 to 190 acres.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this soil in mapping are small areas of moderately well drained Tetotum soils and well drained Bojac soils. The Tetotum soils are in slight depressions, and the Bojac soils are on ridges and side slopes. Included soils make up about 10 percent of the unit.

The permeability of this State soil is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate. Surface runoff is medium. The erosion hazard is moderate. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content, reduce crusting, increase water infiltration, and reduce erosion.

The potential productivity for trees on this soil is very high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and for septic tank absorption fields. In some areas drainage is needed to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

The capability subclass is IIe.

35—State-Urban land complex. This unit is on broad ridges and side slopes. It consists of deep, nearly level, well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 200 acres. They are about 40 percent State soils, 35 percent urbanized areas, and 25 percent other soils. The State soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark brown loam about 11 inches thick. The subsoil is strong brown and yellowish brown loam 45 inches thick. The substratum is yellowish brown sandy loam that extends to a depth of at least 60 inches.

Included with this unit in mapping are areas of well drained Bojac and Rumford soils, moderately well drained Munden and Tetotum soils, and Udorthents. The Bojac soils and Udorthents are nearly level, and the Rumford soils are strongly sloping to steep. The Munden and Tetotum soils are in slight depressions. Some areas have a seasonal high water table at a depth of 2-1/2 to 4 feet during winter and spring.

The permeability of these State soils is moderate in the subsoil and moderately rapid or rapid in the substratum. Available water capacity is moderate.

Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. The surface layer and subsoil commonly are very strongly acid or strongly acid, but reaction of the surface layer varies because of local liming practices. The substratum commonly ranges from very strongly acid through moderately acid. A seasonal high water table is at a depth of 4 to 6 feet during winter and spring.

The State soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table and the rapid permeability in the substratum are the main limitations of this unit for community development, especially as a site for buildings and septic tank absorption fields. Drainage helps to improve the suitability of the soil as a site for buildings and septic tanks, but the design and installation of septic tanks must meet State and local criteria. The permeability causes a hazard of contamination to water in areas used as a site for septic tanks.

This unit is not assigned to a capability subclass.

36—Tetotum loam. This soil is deep, nearly level, and moderately well drained. It is on low ridges and side slopes on inland areas on the lower part of the Coastal Plain. The areas of this soil commonly are irregularly shaped and range from 2 to 480 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is brown loam about 10 inches thick. The subsoil is 48 inches thick. It mostly is yellowish brown loam and clay loam with gray and brown mottles in the lower part. The substratum is mottled brown, yellow, and gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of well drained Bojac and State soils; moderately well drained Munden and Yeopim soils; and somewhat poorly drained Augusta, Chapanoke, and Dragston soils. The Bojac and State soils are at slightly higher elevations. The Munden soils are on low ridges and side slopes. The other soils are in slight depressions. Also included are areas of undulating soils adjacent to lakes, bays, and large drainageways. These areas have slopes of 15 to 30 percent that range from 20 to 50 feet long. They are dissected by many short drainageways and generally have more sand and less clay in the subsoil than is typical for this Tetotum soil. Included soils make up about 15 percent of the unit.

The permeability of this Tetotum soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of greater than 60 inches. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

Most areas of this soil are used for cultivated crops or are in community development. The remaining areas are in woodland.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. The soil is wet and cold in the early spring, and planting and tillage sometimes are delayed because of wetness. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seed and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting the use of heavy timber equipment.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria.

The capability subclass is IIw.

37—Tetotum-Urban land complex. This unit is on low ridges and side slopes. It consists of deep, nearly level, moderately well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 2 to 100 acres. They are about 40 percent Tetotum soils, 35 percent urbanized areas, and 25 percent other soils. The Tetotum soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Tetotum soils is brown loam about 10 inches thick. The subsoil is 48 inches thick. It mostly is yellowish brown loam and clay loam with gray and brown mottles in the lower part. The substratum is mottled brown, yellow, and gray loamy sand to a depth of at least 60 inches.

Included with this unit in mapping are areas of well drained Bojac and State soils, moderately well drained Munden soils, somewhat poorly drained Augusta and Dragston soils, and Udorthents. The Bojac and State soils are at slightly higher elevations. The Augusta and Dragston soils are in slight depressions. The Udorthents and Munden soils are nearly level.

The permeability of these Tetotum soils is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The

subsoil has a low shrink-swell potential. The root zone extends to a depth of more than 60 inches. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and early spring.

The Tetotum soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tank absorption fields must meet State and local criteria.

This unit is not assigned to a capability subclass.

38—Tomotley loam. This soil is deep, nearly level, and poorly drained. It is on broad inland flats and in shallow drainageways. The areas of this soil commonly are irregularly shaped or oval and range from 2 to 700 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is dark grayish brown loam about 7 inches thick. The subsoil is 38 inches thick. It mainly is gray and light brownish gray loam and sandy clay loam with yellowish brown mottles. The substratum is mottled, gray loamy sand to a depth of at least 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Augusta and Dragston soils, poorly drained Acredale and Nimmo soils, and very poorly drained Nawney and Portsmouth soils. The Augusta and Dragston soils are at slightly higher elevations. The Nimmo and Acredale soils are on flats and in shallow drainageways. The Nawney soils are in drainageways, and the Portsmouth soils are in slight depressions. Also included are areas that have water on the surface after heavy rains or during prolonged wet periods. Included soils make up about 25 percent of the unit.

The permeability of this Tomotley soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is moderate in organic matter content and low in natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between the surface and a depth of 1 foot during winter and spring.

Most areas of this soil have been drained and are used for cultivated crops. The remaining areas are in community development or woodland.

Drained areas of this soil are well suited to cultivated crops (fig. 3). Crops respond well to lime and fertilizer but are sometimes damaged in undrained areas after heavy or prolonged rains. The soil is wet and cold in spring, and wetness often interferes with tillage. Tilling within the proper range of moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

The capability subclass is IVw.

39—Tomotley-Urban land complex. This unit is on broad inland flats. It consists of deep, nearly level, poorly drained soils and areas covered by parking lots, buildings, and other structures. The areas of the unit commonly are irregularly shaped and range from 2 to 260 acres. They are about 40 percent Tomotley soils, 35 percent urbanized areas, and 25 percent other soils. The Tomotley soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Tomotley soils is dark grayish brown loam about 7 inches thick. The subsoil is 38 inches thick. It mainly is gray and light brownish gray loam and sandy clay loam with yellowish brown mottles. The substratum is mottled, gray loamy sand to a depth of at least 60 inches.

Included with this complex in mapping are areas of poorly drained Acredale and Nimmo soils, somewhat poorly drained Augusta and Dragston soils, and Udorthents. The Acredale and Nimmo soils are on broad flats. The Augusta and Dragston soils are at slightly higher elevations. The Udorthents are nearly level.

The permeability of these Tomotley soils is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is moderate in organic matter content and low in natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is between

Figure 3.—Drainage ditch on Tomotley loam.

the surface and a depth of 1 foot during winter and spring.

The Tomotley soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table is the main limitation of this unit for community development, especially as a site for buildings or septic tank absorption fields. Drainage helps to overcome the water table, but the design and installation of septic tanks must meet State and local criteria.

This unit is not assigned to a capability subclass.

40—Udorthents, loamy. This unit consists of deep, well drained and moderately well drained soil material in areas that have been altered during excavation or covered by earthy fill material. Udorthents are mostly in and near urban areas, major highways, canals, and mining operations. The areas of this unit are irregularly shaped and range from about 2 to 200 acres. Slopes range from 0 to 25 percent.

Included with this unit in mapping are small areas of undisturbed soils. Also included are small bodies of water and areas of more poorly drained disturbed soils. Many areas have inclusions of nonsoil material, such as asphalt, concrete, wood, and glass. Inclusions make up about 25 percent of the unit.

The permeability and available water capacity of these Udorthents is variable. Surface runoff is rapid, and the erosion hazard is severe on steep areas with no vegetation.

These Udorthents generally are not suited to farming and are limited for most types of community development and recreation, but some areas are used for community development. Onsite investigation is needed to determine the suitability and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

41—Udorthents-Urban land complex. This unit consists of two main land types: (1) deep, nearly level, well drained and moderately well drained soil material in

areas that have been altered during excavation or covered by earthy fill material; (2) areas covered by parking lots, buildings, and other structures. The two are so intermingled that it was not practical to map them separately. The areas of this unit commonly are irregularly shaped and range from 2 to 250 acres. They are about 40 percent Udorthents, 35 percent Urban land, and 25 percent other soils. Slopes range from 0 to 2 percent.

Included with this unit in mapping are small areas of mostly undisturbed soils. Many fill areas have inclusions of nonsoil materials, such as concrete, wood, glass, and asphalt.

The permeability, runoff, and available water capacity of this unit are variable. The erosion hazard is slight.

An onsite investigation is needed to determine the suitabilities and limitations of the unit for any use.

This unit is not assigned to a capability subclass.

42—Urban land. This unit consists of areas where more than 80 percent of the surface is covered by parking lots, buildings, and other structures. Examples are military installations, shopping centers, and industrial parks. These areas are throughout the survey area, but the largest are in business districts and along main roads. The areas of this unit commonly are irregularly shaped and range from about 2 to 270 acres. Slopes range from 0 to 2 percent.

Included with this unit in mapping are areas of undisturbed soils and Udorthents. The undisturbed soils are mainly between streets and sidewalks, in yards, and in traffic islands and circles. The Udorthents are areas where the natural soils have been disturbed by grading, excavating, or filling. These areas generally are less than 500 square feet. Included soils make up about 20 percent of the unit.

Onsite investigation is needed to determine the suitabilities and limitations of this unit for any use.

This unit is not assigned to a capability subclass.

43—Yeopim silt loam. This soil is deep, nearly level, and moderately well drained. It is on uplands and side slopes bordering major drainageways mostly in the northern part of the City. The areas of this soil commonly are irregularly shaped and range from 2 to 100 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer of this soil is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam 5 inches thick. The subsoil is 71 inches thick. The upper part is yellowish brown and light olive brown silt loam and silty clay loam. The lower part is mottled gray and brown silty clay loam. The substratum is yellowish brown loamy sand to a depth of at least 84 inches.

Included with this soil in mapping are small areas of well drained State soils, moderately well drained Tetotum soils, and somewhat poorly drained Augusta and Chapanoke soils. The State and Tetotum soils are at slightly higher elevations, and the Augusta and Chapanoke soils are in slight depressions. Also included are areas of undulating soils adjacent to lakes, bays, and large drainageways. These soils have slopes of 15 to 30 percent that range from 20 to 50 feet long, are dissected by many short drainageways, and generally have more sand in the subsoil than is typical for this Yeopim soil. Areas of Yeopim soil that have a subsoil less than 60 inches deep are generally west of Oceana Ridge and in the Blackwater area of the City. Also included are small areas of soils that are similar to this Yeopim soil but that have slow permeability. Included soils make up about 15 percent of the unit.

The permeability of this Yeopim soil is moderately slow in the subsoil and moderately rapid in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in organic matter content and natural fertility. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and spring.

Most areas of this soil are in community development. The remaining areas are in woodland or are used for cultivated crops.

This soil is well suited to cultivated crops. Crops respond well to lime and fertilizer. The soil is usually wet and cold in the early spring, and wetness often interferes with planting and tillage. The surface layer is thin, and tilth is only fair, but tilling within the proper soil moisture content reduces soil compaction and clodding. Conservation tillage, using cover crops and grasses and legumes in the cropping system, and using crop residue are practices that help to maintain organic matter content and tilth, reduce crusting, and increase water infiltration.

The potential productivity for trees on this soil is high, especially for loblolly pine, yellow-poplar, sweetgum, and oaks. Seeds and seedlings survive and grow well if competing vegetation is controlled. The soil is soft when wet, thus limiting use of heavy timber equipment.

The seasonal high water table, the moderately slow to slow permeability, and low strength are the main limitations of this unit for community development. The seasonal high water table and the permeability limit the soil as a site for septic tank absorption fields. Drainage helps to improve the suitability for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria.

The capability subclass is IIw.

44—Yeopim-Urban land complex. This unit is on uplands bordering major drainageways that are mostly in the northern part of the City. It consists of deep, nearly

level, moderately well drained soils and areas covered by parking lots, buildings, and other structures. The areas of this unit commonly are irregularly shaped and range from 5 to 150 acres. They are about 40 percent Yeopim soils, 35 percent urbanized areas, and 25 percent other soils. The Yeopim soils and urbanized areas are so intermingled that it was not practical to map them separately. Slopes range from 0 to 2 percent.

Typically, the surface layer of the Yeopim soils is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam 5 inches thick. The subsoil is 71 inches thick. The upper part is yellowish brown and light olive brown silt loam and silty clay loam. The lower part is mottled gray and brown silty clay loam. The substratum is yellowish brown loamy sand to a depth of at least 84 inches.

Included with this unit in mapping are areas of well drained State soils, moderately well drained Tetotum soils, somewhat poorly drained Augusta and Chapanoke soils, and Udorthents. The State and Tetotum soils are at slightly higher elevations, and the Augusta and Chapanoke soils are in slight depressions. The Udorthents are nearly level. Also included are small areas of soils that are similar to these Yeopim soils but that have slow permeability.

The permeability of these Yeopim soils is moderately slow in the subsoil and moderately rapid in the substratum. Available water capacity is high. Surface runoff is slow. The erosion hazard is slight. The subsoil has a low shrink-swell potential. The root zone extends to a depth of 60 inches or more. The soil is low in natural fertility and organic matter content. It commonly ranges from extremely acid through strongly acid, but reaction of the surface layer varies because of local liming practices. A seasonal high water table is at a depth of 1-1/2 to 2-1/2 feet during winter and spring.

The Yeopim soils in this unit mostly are used for lawns, gardens, and parks.

The seasonal high water table, the moderately slow to slow permeability, and low strength are the main limitations of this unit for community development. The seasonal high water table and the permeability limit the soil as a site for septic tank absorption fields. Drainage helps to improve the suitability for septic tank absorption fields, but the design and installation of septic tank absorption fields must meet State and local criteria. The low strength limits the soil as a site for local streets and roads, but this limitation can be overcome by strengthening or replacing the base material.

This unit is not assigned to a capability subclass.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land, but not urban and built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. It also has favorable temperature and growing season and acceptable levels of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope range is mainly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 94,055 acres of the land area of the City of Virginia Beach meets the soil requirements for prime farmland. However, because of rapidly expanding urban development and areas that are not drained and developed for cropland, the Soil Conservation Service and the Agricultural Extension Service estimate that only about 50,000 acres, or nearly 31 percent of the land area, is prime farmland that is used for crop production.

A recent trend in land use in some parts of the survey area has been toward the loss of some prime farmlands to industrial and urban uses (fig. 4). The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more wet, erodible, droughty, and difficult to cultivate and usually are less productive.

Soil map units that make up prime farmland in the City of Virginia Beach are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have a seasonal high water table may qualify for prime farmland if the limitation is overcome by drainage. In table 5 the need for drainage is shown in parentheses after the map unit name. Onsite evaluation is necessary to see if the limitation has been overcome.

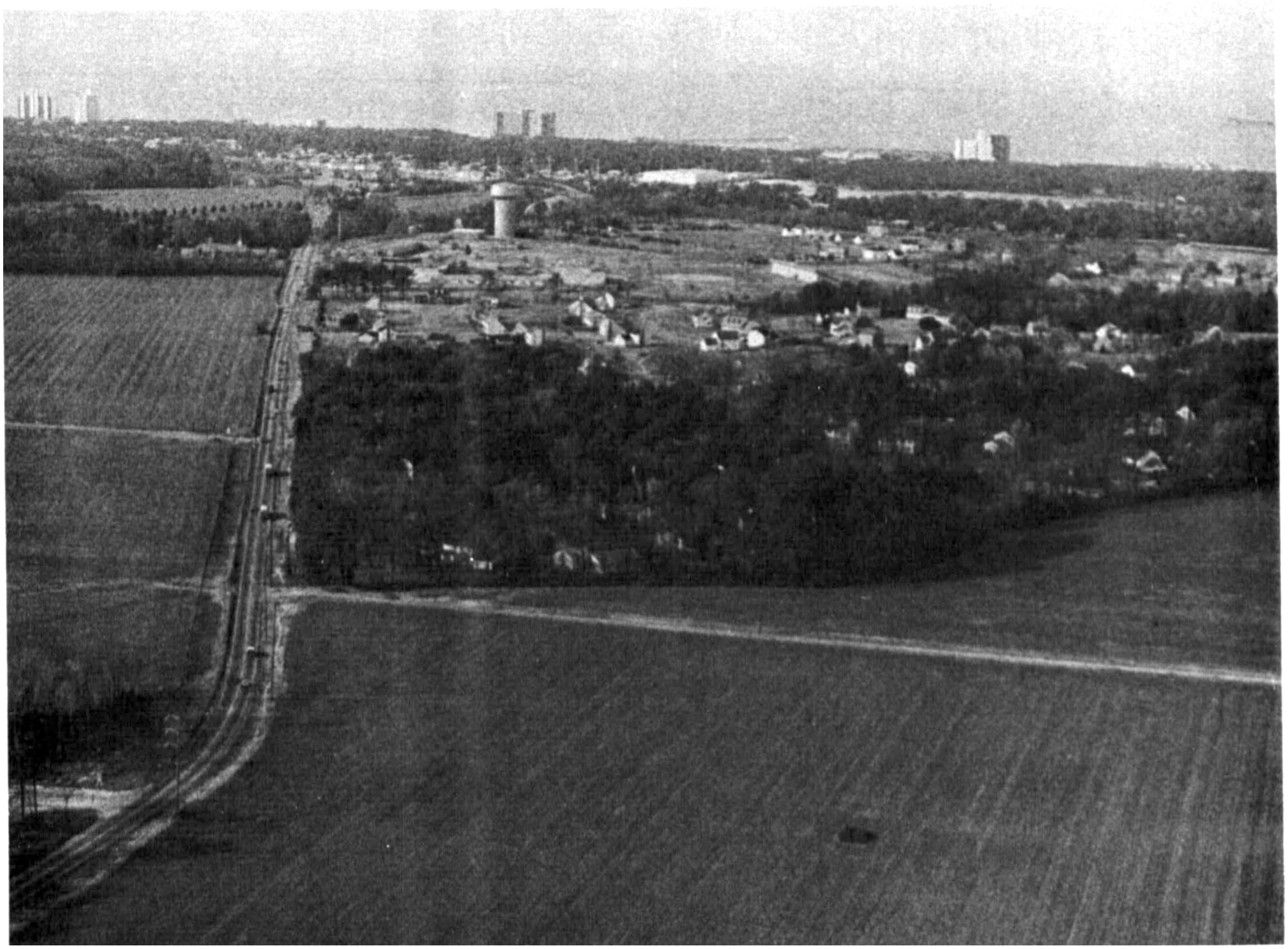


Figure 4.—Urban development near an area of prime farmland.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where sandy layers, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Beach, Dune, and Marsh System

L.E. Cullipher, district conservationist, Soil Conservation Service, assisted with the preparation of this section.

A group of narrow landforms that are parallel to the coast of the survey area makes up what is called the beach, dune, and marsh system. The system is part of the barrier islands range that includes Cape Henry, Sandbridge, Back Bay National Wildlife Refuge, and False Cape State Park. The landforms that make up the system have formed from unconsolidated sandy sediments, and they generally are separated from the mainland by estuaries.

The system is subject to stress and continual change by wave, wind, and tidal forces. Seasonal and other cyclic fluctuations in wave patterns and intensity combine with ocean storms and hurricanes to form and re-form the islands. The beaches and dunes migrate in response to these fluctuations, and storm overwash and winds periodically carry sands inland, leaving substantial deposits of new sediment on the islands.

The system has a strong appeal to man as a recreational and living area, but the beach environment is hostile to plant life. Even native plants that are suited to seaside conditions are difficult to establish and maintain. The sandy soils are extremely low in available water, organic matter content, and fertility. Plants are constantly subject to salt spray and blowing sand.

The plants along the dunes are grouped together in what has been called "the salt spray community." A number of natural forces on the beach influence plant life, but by far the most important factor is salt spray. Plants vary considerably in their tolerance to salt spray. The most tolerant beach grasses and herbaceous plants are closest to the ocean. Plants with less tolerance to the salt spray and violent winds of frontal areas are farther inland.

The coastal plants are grouped in four generalized zones, depending upon their tolerance to salt spray (fig. 5). These zones are: (1) the pioneer zone, or grass zone, which is closest to the ocean and has the most direct exposure to the elements; (2) the shrub zone, which mainly starts behind the protection of frontal dunes; (3) the forest zone, which is adjacent to the shrub zone; (4) the marsh zone, which is on the edge of Back Bay. While there is always intergrading and overlapping of plants between zones, many species are nearly exclusive to a particular zone.

The prevalent plants in the pioneer zone are: American beachgrass, coastal panicgrass, bitter panicum, sea-oats, and marshhay cordgrass.

The prevalent plants in the shrub zone are: northern bayberry, wax myrtle, marsh elder, groundsel tree, Virginia creeper, trumpetcreeper, poison ivy, and seaside bluestem.

The prevalent plants in the forest zone are: live oak, loblolly pine, black cherry, and muscadine grape.

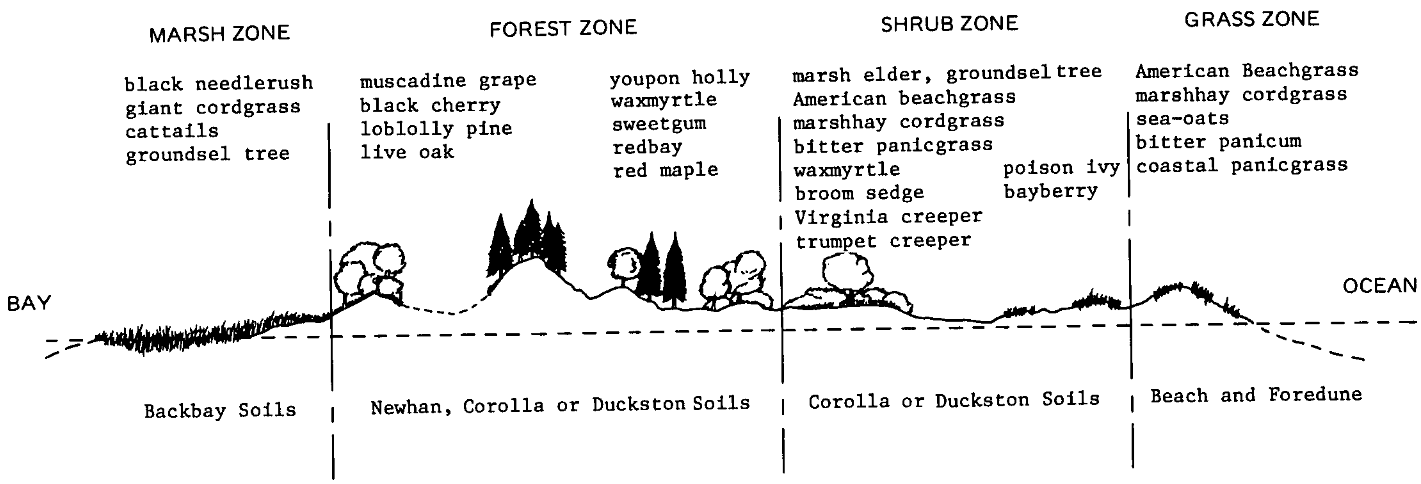


Figure 5.—Characteristic soil types and dominant vegetation between Back Bay and the Atlantic Ocean.

The prevalent plants in the marsh zone are: black needlerush, giant cordgrass, cattails, and groundsel tree.

Some of the plants in the four zones, along with simple structures such as fences, help to stabilize the dunes and the shoreline. All of the plants respond well to applications of fertilizer, and those in the forest, shrub, and grass zones respond well to irrigation.

Crops and Pasture

James Belote, agronomist, Virginia Polytechnic Institute and State University Extension Service, assisted with the preparation of this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

The City of Virginia Beach had nearly 44,000 acres of cropland in 1981, according to the Virginia Cooperative Extension Service. Corn, wheat, and soybeans were grown on most of this acreage. Some areas were used for vegetables, pasture, and ornamentals. With proper management, most upland soils in the survey area are well suited to most crops commonly grown in the area.

This survey area has numerous broad, flat upland areas consisting of very poorly drained or poorly drained soils. The limitations of these soils are a seasonal high water table and the lack of adequate surface drainage. Many of these soils have water on the surface after heavy rainfall, thereby hindering the use of heavy equipment and harming the crops. To remove this excess water, most farmers construct networks of shallow open ditches. They then shape the fields to enhance surface runoff. However, adequate outlets for drainage systems are not available in some areas. In the southern part of the City, wind tides make drainage difficult.

No-till farming, or conservation tillage, is a practice in which a second crop is planted in the stubble of the first crop without plowing under or burning the stubble. With proper fertilization and weed control, the additional moisture held by the stubble can help boost crop yields in droughty years.

The soils of the survey area are naturally acid. When the soils are put under cultivation, lime is required to bring the acidity to a level the crops can tolerate.

Soil erosion is not as critical in this survey area as it is in other parts of the state. Erosion does occur, however, even on the nearly level areas. Erosion can be minimized on the gently sloping areas by using contour cropping and conservation tillage.

The Virginia Cooperative Extension Service estimated that only 1,500 acres of the City's farmland was in pasture or hay in 1981. It is not economically feasible for most farmers to use cropland for long-term beef production or dairy operations when high annual yields can be obtained from row crops. Generally, wetness is the main limitation of the soils for pasture and hay.

The carrying capacity of pastures can be enhanced by using drainage, proper stocking rates, rotational and deferred grazing, and lime and fertilizer. Overgrazing and grazing when the soil is too wet cause compaction of the surface layer and damage the stands of grasses and legumes. Most soils are not suited to alfalfa because of the seasonal high water table. Much of the hay and pasture in the survey area is a mixture of fescue and clover.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow or droughty; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar

management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The capability classification of each map unit is given in the section "Detailed soil map units" and in table 6.

Woodland Management and Productivity

Woodland covers about 57,600 acres, or 35 percent of the land area, in the City of Virginia Beach. The common trees on the uplands are southern red oak, white oak, hickory, sweet gum, and loblolly pine. The main species on bottom land or in swamps are baldcypress, tupelo gum, maple, willow oak, and water oak. Most of the woodland is used for wildlife habitat, recreation, and esthetic purposes. Much of the merchantable timber is on soils with a seasonal high water table which limits the use of heavy equipment during wet seasons.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

One of the major sources of recreation in the City of Virginia Beach is the nearly 40 miles of coastline along the Chesapeake Bay and the Atlantic Ocean. Boating, swimming, hiking, and camping facilities are available throughout the City. Some of the major recreation areas for swimming are Chesapeake Beach, the Oceanfront resort area, and Sandbridge Beach, as well as the numerous lakes and rivers.

The City has an extensive system of parks and wildlife areas managed by local, State, and Federal agencies. The parks, particularly Seashore State Park, are popular camping, hiking, and picnic areas.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The

capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is firm after rains and is not dusty when dry.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

The combinations of marshland, farmland, woodland, and open water areas in the City of Virginia Beach attract a wide variety of wildlife. Numerous State and Federal wildlife refuges and management areas provide habitat for waterfowl, deer, fish, and small game. The marshes of Virginia Beach provide an excellent habitat for shorebirds and migratory waterfowl such as ducks and geese. The marshes are primarily around Back Bay, the North Landing River, and the Lynnhaven River. The City's abundant water resources provide an excellent habitat for numerous saltwater and freshwater sport fish. Back Bay is popular for bass fishing, while the Chesapeake Bay and Atlantic Ocean are known for their abundance of spot, bluefish, trout, flounder, and other saltwater species. The survey area's cropland, fallow fields, cutover woodland, and forests provided a habitat for game species such as white-tailed deer, rabbit, and squirrel. Quail and dove, as well as numerous species of other birds, are abundant in the area.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, sorghum, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are tall fescue, coastal bermudagrass, blackwell switchgrass, and clover.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, foxtail millet, pokeberry, beggarweed, partridgepea, switchcane, and crabgrass.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, blackgum, red maple, dogwood, hickory, holly, redbay, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are cardinal, autumn-olive, and rem-red amur honeysuckle.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, redcedar, and baldcypress.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, and slope. Examples of wetland plants are smartweed, wild millet, saltgrass, cordgrass, rushes, sedges, reeds, marsh elder, groundsel tree, marsh hibiscus, and cattails.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are wetness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, killdeer, meadowlark, mourning dove, field sparrow, and cottontail.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, and mink.

Engineering

Bartley Tuthill, soil scientist, City of Virginia Beach Environmental Services, assisted with the preparation of this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, soil wetness, depth to a seasonal high water

table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by a cemented pan or a very firm dense layer, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table. Many of the soils in the City of Virginia Beach have a seasonal high water table and a sandy substratum that hinder excavations and make the use of well points and embankment stabilization equipment necessary for such excavations.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, and flooding affect absorption of the effluent.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness. In soils with a seasonal high water table, local health department officials may approve the use of septic tank absorption fields provided that certain management practices are applied. Some of these practices include the installation of an oversize drainfield and enhancing surface runoff with proper landscaping and ditching. Homesites on these soils need sufficient area to install the needed management practices.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, flooding, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and sandy layers can cause construction problems.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, slope, and flooding affect both types of landfill. Texture, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal

compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by a high water table and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential or slopes of 15 to 25 percent. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing (fig. 6). Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil) and the thickness of suitable material. Acidity and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick. All other soils are rated as an improbable source.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They have little or no gravel and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, and grassed waterways.

Figure 6.—Mining sand on Bojac and Munden soils on Pungo Ridge.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of organic matter or salts. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to

layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, and subsidence of organic layers. Excavating and grading and the stability of ditchbanks are affected mostly by slope and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by soil texture. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Wetness and slope affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet

and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years (fig. 7). The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

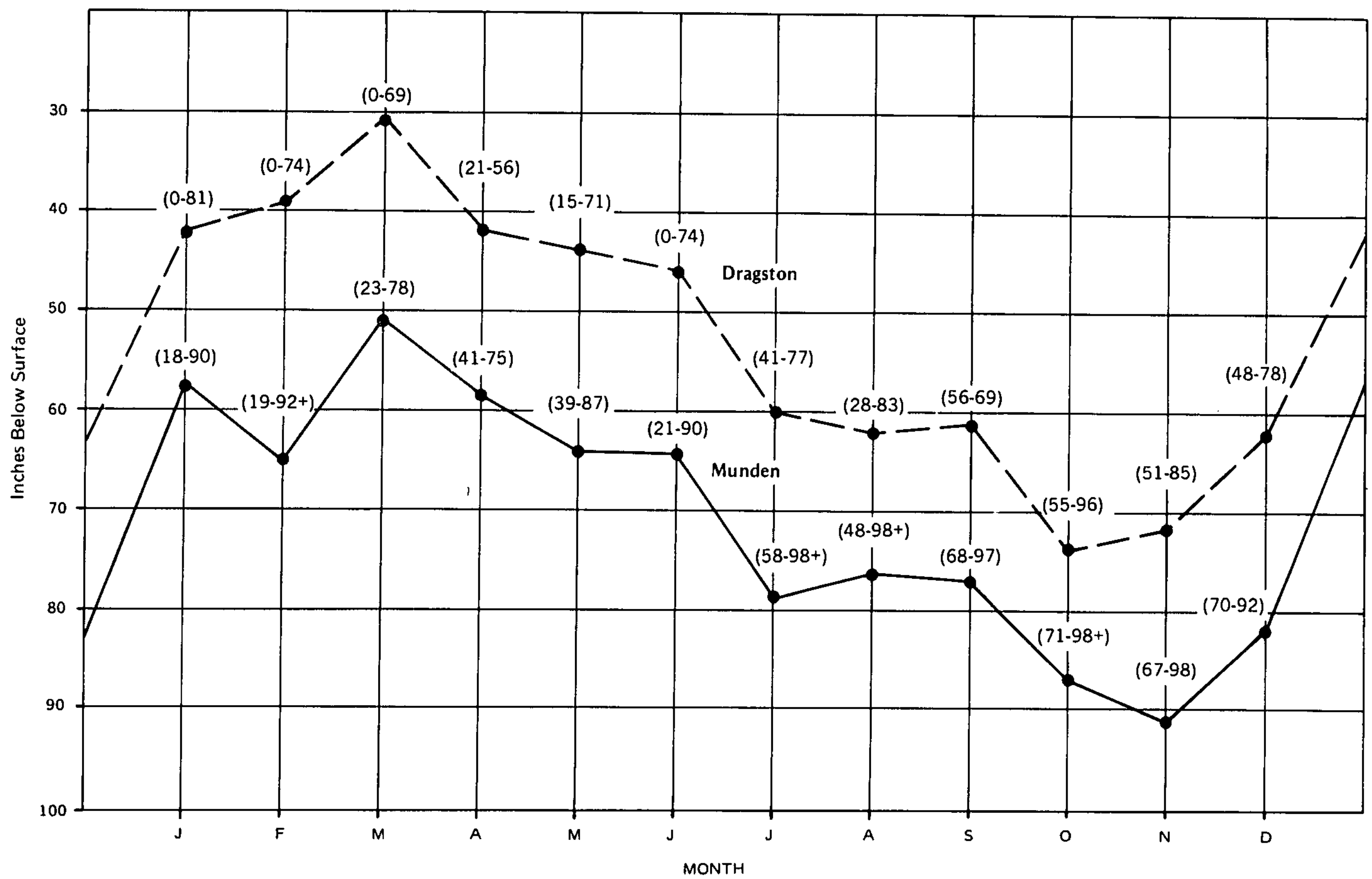


Figure 7.—Average monthly water table levels of a somewhat poorly drained Dragston soil and a moderately well drained Munden soil during 1976-81. The range in parentheses is the maximum and minimum for each month.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 16 shows the expected initial subsidence, which usually is a result of drainage, and annual subsidence, which usually is a result of oxidation.

Not shown in the table is subsidence caused by an imposed surface load or by the withdrawal of ground water throughout an extensive area as a result of lowering the water table.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*5*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 17 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquults (*Aqu*, meaning water, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Ochraquults (*Ochra*, meaning presence of ochric epipedon, plus *aquults*, the suborder of the Ultisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Ochraquults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, thermic Typic Ochraquults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*4*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*5*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Acredale series

The soils of the Acredale series are deep and poorly drained. They formed in loamy marine and fluvial sediments. The Acredale soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Acredale soils commonly are near Augusta, Chapanoke, Dragston, Hyde, Nawney, Nimmo, Portsmouth, and Tomotley soils. The Acredale soils have more gray in the upper part of the argillic horizon than the Augusta, Chapanoke, or Dragston soils. The Acredale soils do not have an umbric epipedon, as do

the Hyde and Portsmouth soils, and have more silt and clay in the subsoil than the Nimmo soils and less sand and more silt in the subsoil than the Tomotley soils. The Acredale soils are not subject to flooding as are the Nawney soils.

Typical pedon of Acredale silt loam, about 4.5 miles northwest of Princess Anne, 1,700 feet south-southwest of the intersection of Lynhaven Parkway and Princess Anne Road:

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam; weak fine granular structure; very friable, slightly sticky, slightly plastic; common fine and very fine roots; common fine and medium pores; strongly acid; clear smooth boundary.

B1tg—7 to 15 inches; light brownish gray (10YR 6/2) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and very fine roots; common very fine vesicular pores and few fine tubular pores; many very fine sand grains coated and bridged with clay; very strongly acid; abrupt smooth boundary.

B21tg—15 to 35 inches; gray (5Y 5/1) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; friable, sticky, plastic; common very fine roots; few fine vesicular pores and few fine tubular pores; many thin continuous clay films on faces of peds; many very fine sand grains coated and bridged with clay; pockets of silt 1/2 inch to 3 inches in diameter that are white when dry; very strongly acid; clear smooth boundary.

B22tg—35 to 43 inches; mottled light greenish gray (5GY 7/1), dark gray (N 4/0), and yellowish brown (10YR 5/8) silt loam; moderate fine and medium subangular blocky structure; friable, sticky, plastic; few very fine roots; few very fine vesicular pores; few thin discontinuous clay films on faces of peds; few very fine sand grains coated and bridged with clay; few fine prominent yellowish red stains along root channels; very strongly acid; clear smooth boundary.

IIB3tg—43 to 50 inches; mottled light gray (10YR 6/1), light greenish gray (5GY 7/1), and yellowish brown (10YR 5/8) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few fine vesicular pores; few thin discontinuous clay films on faces of peds; few sand grains coated and bridged with clay; many clean sand grains; common pockets of clean white sand up to 3 inches in diameter; strongly acid; clear wavy boundary.

IICg—50 to 66 inches; mottled gray (5Y 6/1), light olive gray (5Y 6/2), and yellowish brown (10YR 5/8) fine sandy loam; massive; very friable, nonsticky, nonplastic; few very fine vesicular pores; many fine flakes of mica; moderately acid.

The solum thickness ranges from 40 to 60 inches. The A horizon in unlimed areas ranges from extremely acid through strongly acid. The B and C horizons range from very strongly acid through neutral.

The A horizon has hue of 10YR or 2.5Y, value of 2 through 6, and chroma of 1 through 3. Where value is 2 or 3, the horizon is less than 6 inches thick. The A horizon is silt loam, loam, or very fine sandy loam.

The B1 horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 2. It is loam or silt loam. Some pedons do not have a B1 horizon.

The hue, value, and chroma of the B2t horizon are similar to those of the B1 horizon. The lower part of the B2t horizon has hue of 5GY and 5G, value of 4 through 6, and chroma of 1. The upper part of the B2t horizon is silty clay loam or silt loam. The lower part is loam, clay loam, silt loam, silty clay loam, or silty clay.

Most pedons have a B3 horizon that has hue of 10YR through 5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 2; or hue of 5GY or 5G, value of 4 through 6, and chroma of 1. The texture of the B3 horizon is similar to that of the lower part of the B2t horizon but ranges to sandy loam or sandy clay loam in some pedons.

The hue, value, and chroma of the C horizon are similar to those of the B3 horizon. The C horizon mainly is sand, loamy sand, sandy loam, or fine sandy loam. In some pedons it has thin strata of finer textured material.

Augusta series

The soils of the Augusta series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. The Augusta soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Augusta soils commonly are near Acredale, Chapanoke, Tetotum, Tomotley, and Yeopim soils. The Augusta soils are not as gray in the upper part of the argillic horizon as are the Acredale or Tomotley soils. The Augusta soils have more brown mottles near the surface than the Tetotum or Munden soils and have less silt in the argillic horizon than the Chapanoke or Yeopim soils.

Typical pedon of Augusta loam, about 3,500 feet west-northwest of the junction of West Landing and West Neck Roads, and 350 feet north of West Landing Road:

Ap—0 to 8 inches; light olive brown (2.5Y 5/4) loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; few fine and common very fine roots; strongly acid; abrupt smooth boundary.

B1t—8 to 13 inches; light yellowish brown (2.5Y 6/4) loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B21t—13 to 18 inches; light yellowish brown (2.5Y 6/4) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B22t—18 to 27 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B23tg—27 to 34 inches; light brownish gray (2.5Y 6/2) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles, common medium distinct light gray (10YR 6/1) mottles, and common fine and medium prominent black (N 2/0) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B24tg—34 to 45 inches; light gray (10YR 6/1) clay loam; few medium prominent brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear wavy boundary.

IIC—45 to 63 inches; mottled light yellowish brown (2.5Y 6/4) and light gray (10YR 6/1) loamy sand; massive; very friable; many clean sand grains; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from very strongly acid through moderately acid.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 or 4. Some pedons have an A2 horizon with hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 2 through 4. The A horizon is sandy loam, loam, or silt loam.

The B1 horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 3 through 8. It has high- or low-chroma mottles. It is sandy loam, silt loam, loam, or sandy clay loam.

The upper part of the B2t horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 through 6. It has high- or low-chroma mottles. The lower part of the B2t horizon has hue of 10YR through 5Y, value of 5 through 7, and chroma of 1 or 2, and it is mottled. Some pedons do not have a dominantly gray matrix but are mottled in many shades. The B2t horizon is loam, silt loam, clay loam, or sandy clay loam.

Some pedons have a B3 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is sandy loam, loam, or clay loam.

The hue, value, and chroma of the IIC horizon are similar to those of the lower part of the B2t horizon. The IIC horizon mainly is sand, loamy sand, or sandy loam. Some pedons are stratified and have pockets or layers of sandy clay loam or clay loam. Some pedons do not have a lithologic discontinuity.

Backbay series

The soils of the Backbay series are deep and very poorly drained. They formed in organic material and the underlying loamy marine and fluvial sediments. The Backbay soils are in marshes on the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Backbay soils commonly are near Corolla, Dragston, Duckston, Nawney, Nimmo, and Tomotley soils. The Backbay soils are frequently flooded and have a histic epipedon, whereas the Corolla, Dragston, Duckston, Nimmo, and Tomotley soils are not frequently flooded and do not have a histic epipedon. The Backbay soils are in marshes; the Nawney soils are wooded and have less than 8 inches of organic material on the surface.

Typical pedon of Backbay mucky peat, about 1,900 feet from the eastern side of Long Island and 1,000 feet from the northern edge of Long Island, in the Back Bay National Wildlife Refuge:

Oe—0 to 11 inches; very dark brown (10YR 2/2) mucky peat (hemic material); about 36 percent fiber, 28 percent rubbed; massive; common fine and medium roots; very pale brown (10YR 7/3) sodium pyrophosphate extract; slight sulfide odor; strongly acid; clear smooth boundary.

A1—11 to 22 inches; black (10YR 2/1) silt loam; weak medium granular structure; slightly sticky, slightly plastic; common fine and medium roots; slightly acid; clear smooth boundary.

C1g—22 to 33 inches; gray (10YR 5/1) sandy clay loam; massive; sticky, slightly plastic; few medium roots; few fine flakes of mica; neutral; clear smooth boundary.

C2g—33 to 47 inches; gray (N 6/0) silty clay loam; common medium distinct light olive brown (2.5Y 5/6) mottles; massive; slightly sticky, plastic; few

fine flakes of mica; neutral; gradual smooth boundary.

C3g—47 to 60 inches; gray (N 6/0) silty clay loam; many coarse distinct light olive brown (2.5Y 5/6) mottles; massive; slightly sticky, plastic; common fine flakes of mica; neutral.

The soil ranges from very strongly acid through moderately acid in the organic surface layer and from strongly acid through neutral in the mineral horizons. The sulfur content in the organic surface layer ranges from 0.1 to 1.4 percent.

The O horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 or 2. It is mucky peat or muck.

The A1 horizon has hue of 7.5YR through 2.5Y or is neutral, has value of 2 or 3, and has chroma of 0 through 2. It is sandy loam, loam, or silt loam.

The Cg horizon has hue of 10YR through 5BG or is neutral, has value of 4 through 7, and has chroma of 0 through 2. It mainly is sandy loam, loam, silt loam, sandy clay loam, clay loam, or silty clay loam. It commonly is stratified. Some pedons have subhorizons of sandy or clayey material. Flakes of mica are few to common.

Bojac series

The soils of the Bojac series are deep and well drained. They formed in loamy fluvial and marine sediments. The Bojac soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Bojac soils commonly are near Munden, State, and Tetotum soils. The Bojac soils do not have gray mottles in the subsoil as do the Munden soils. The Bojac soils have less clay in the argillic horizon than the State or Tetotum soils.

Typical pedon of Bojac fine sandy loam, about 3,100 feet north-northwest of the junction of Princess Anne Road and Pungo Ferry Road, 900 feet west of Princess Anne Road and 3,000 feet north of Pungo Ferry Road:

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable, slightly sticky, nonplastic; common fine and very fine roots; moderately acid; abrupt smooth boundary.

B21t—8 to 15 inches; strong brown (7.5YR 5/8) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and very fine roots; many sand grains bridged and coated with clay; strongly acid; clear smooth boundary.

B22t—15 to 32 inches; strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and common very fine roots; few thin discontinuous clay films on faces of peds; many sand grains bridged and coated with clay; very strongly acid; clear smooth boundary.

B23t—32 to 38 inches; yellowish brown (10YR 5/8) fine sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; common sand grains bridged and coated with clay; very strongly acid; clear smooth boundary.

C1—38 to 48 inches; brownish yellow (10YR 6/6) loamy fine sand; single grain; loose; few fine roots; many sand grains stained; strongly acid; clear smooth boundary.

C2—48 to 62 inches; mottled brownish yellow (10YR 6/8) and yellow (10YR 7/8) fine sand; single grain; loose; few very fine roots; moderately acid.

The solum thickness ranges from 30 to 50 inches. The soil in unlimed areas is very strongly acid through moderately acid. The silt content ranges from 20 to 40 percent in the textural control section.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 through 5, and chroma of 3 or 4. It is loamy sand, sandy loam, fine sandy loam, or loam.

Some pedons have a B1 horizon that has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 6. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has hue of 5YR through 10YR, value of 5 or 6, and chroma of 4 through 8. In some pedons it has low-chroma mottles at a depth of more than 40 inches. The B2t horizon mainly is sandy loam, fine sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the B2t horizon. The B3 horizon is loamy sand or loamy fine sand.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 3 through 8. Some pedons have high- and low-chroma mottles. The C horizon commonly is stratified and ranges from sand to loamy fine sand.

Chapanoke series

The soils of the Chapanoke series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. Chapanoke soils are on uplands on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Chapanoke soils commonly are near Acredale, Augusta, Tetotum, and Yeopim soils. The Chapanoke soils are not as gray in the upper part of the argillic horizon as are the Acredale soils, have more gray near the surface than the Yeopim soils, and have more silt in the argillic horizon than the Augusta or Tetotum soils.

Typical pedon of Chapanoke silt loam, about 4,300 feet northwest of the junction of Hungarian Road and Blackwater Road:

A1—0 to 3 inches; light brownish gray (10YR 6/2) silt loam; weak fine granular structure; friable, slightly

sticky, slightly plastic; common very fine and fine and few medium and coarse roots; common fine and few medium pores; extremely acid; clear smooth boundary.

B1t—3 to 7 inches; olive yellow (2.5Y 6/6) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable, sticky, slightly plastic; few fine and medium roots; common fine and few medium pores; thin discontinuous clay films on faces of peds; extremely acid; clear smooth boundary.

B21t—7 to 12 inches; olive yellow (2.5Y 6/6) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles, few fine distinct strong brown (7.5YR 5/8) mottles, and few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable, sticky, slightly plastic; few fine and medium roots; few fine and medium pores; thin discontinuous clay films on faces of peds; extremely acid; clear smooth boundary.

B22t—12 to 18 inches; mottled light brownish gray (10YR 6/2), light reddish brown (2.5YR 6/4), and strong brown (7.5YR 5/8) silty clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, slightly plastic; few fine roots along faces of prisms; few very fine and fine pores; thin discontinuous clay and silt films on faces of peds; extremely acid; clear smooth boundary.

B23tg—18 to 32 inches; gray (5Y 5/1) silty clay; common coarse prominent strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, plastic; few fine roots along faces of prisms; few very fine and fine pores; thin continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B24tg—32 to 39 inches; mottled gray (5Y 5/1), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/8) silty clay loam; moderate coarse prismatic structure parting to moderate medium subangular blocky; friable, sticky, plastic; few fine roots along faces of prisms; few very fine and fine pores; thin discontinuous clay films on faces of peds; few fine flakes of mica; extremely acid; clear smooth boundary.

B25tg—39 to 46 inches; light gray (10YR 6/1) silty clay loam; common medium prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable, sticky, slightly plastic; few fine roots; few fine pores; thin discontinuous clay films on faces of peds; few fine flakes of mica; very strongly acid; clear smooth boundary.

C1—46 to 53 inches; light yellowish brown (10YR 6/4) silt loam; few fine faint yellowish brown (10YR 5/6) mottles and few medium distinct strong brown (7.5YR 5/8) mottles; massive; friable, slightly sticky, slightly plastic; few fine roots; few fine pores; few fine flakes of mica; extremely acid; gradual smooth boundary.

C2—53 to 72 inches; light yellowish brown (10YR 6/4) fine sandy loam; few fine faint yellowish brown (10YR 5/6) mottles and few medium distinct strong brown (7.5YR 5/8) mottles; massive; friable, slightly sticky, nonplastic; few fine roots; few fine pores; few fine flakes of mica; few old root channels surrounded by iron concretions; pockets of white very fine sand in old root channels; extremely acid.

The solum thickness is more than 40 inches. The soil in unlimed areas ranges from extremely acid through moderately acid. Few to many fine flakes of mica are in the lower part of the solum in most pedons.

The A horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. Some pedons have an A2 horizon that has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 3. It has high- or low-chroma mottles. The A horizon is loam or silt loam.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 3 through 6. It is loam or silt loam. High- or low-chroma mottles are few or common. Some pedons do not have a B1 horizon.

The upper part of the B2t horizon has hue of 2.5Y or 5Y, value of 5 through 7, and chroma of 4 through 6. The lower part of the B2t horizon has hue of 10YR through 5GY or is neutral, has value of 5 through 7, and has chroma of 0 through 2, and is mottled. The B2t horizon typically is silt loam, clay loam, or silty clay loam but ranges to loam and silty clay in the lower part.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is loam, fine sandy loam, very fine sandy loam, silt loam, or sandy clay loam.

The C horizon has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8. It commonly is sand, loamy sand, sandy loam, fine sandy loam, or silt loam that is stratified or in pockets and lenses.

Corolla series

The soils of the Corolla series are deep and moderately well drained to somewhat poorly drained. They formed in sandy marine sediments. The Corolla soils are on coastal areas on the lower part of the Coastal Plain. Slopes range from 0 to 6 percent.

Corolla soils commonly are near Backbay, Duckston, and Newhan soils. The Corolla soils are not as gray in the upper part of the substratum as the Backbay or Duckston soils, and they have mottles in the substratum, which is not typical of the Newhan soils.

Typical pedon of Corolla fine sand, in False Cape State Park, about 4 miles north-northwest of the Virginia-

North Carolina state line and 1,000 feet west of the Atlantic Ocean:

A1—0 to 3 inches; dark grayish brown (10YR 4/2) fine sand; single grain; loose; many clean sand grains, common sand grains stained with organic material; extremely acid; clear broken boundary.
C1—3 to 18 inches; pale brown (10YR 6/3) fine sand; single grain; loose; few pink and blue, common strong brown, and many black sand size mineral grains; extremely acid; clear smooth boundary.
C2—18 to 25 inches; pale brown (10YR 6/3) fine sand; few medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; few pink and blue, common strong brown, and many black sand size mineral grains; extremely acid; clear smooth boundary.
C3g—25 to 60 inches; grayish brown (10YR 5/2) sand; single grain; loose; few pink and blue, common brown, and many black sand size mineral grains; extremely acid.

The thickness of the sandy horizons is more than 72 inches. The soil ranges from extremely acid through neutral. The soil has few to many mineral grains that are black, red, pink, dark brown, or white. Some pedons have a buried A horizon between depths of 25 and 60 inches. It has hue of 10YR, value of 3 or 4, and chroma of 1 or 2.

Most pedons have a thin A horizon that has hue of 10YR, value of 4 through 6, and chroma of 1 or 2. It is sand or fine sand.

The upper part of the C horizon has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. The lower part of the C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Some pedons have few to many high- and low-chroma mottles below a depth of 18 inches. The C horizon is sand or fine sand.

Dorovan series

The soils of the Dorovan series are deep, very poorly drained, and organic. They formed in partially decomposed plant remains. The Dorovan soils are in inland swamps on the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Dorovan soils commonly are near Nawney and Pocaty soils. The Nawney soils are mineral soils, and the Pocaty soils support marsh vegetation and have a high content of sulfur.

Typical pedon of Dorovan mucky peat, 1,400 feet west of the west end of Pungo Ferry Bridge, 100 feet north of Pungo Ferry Road:

Oe—0 to 4 inches; dark brown (7.5YR 3/2) mucky peat (hemic material) consisting of partially decomposed roots, leaves, twigs, and moss; about 50 percent rubbed fiber; massive; slightly sticky; many very fine and fine roots and common medium roots; extremely acid; gradual wavy boundary.
Oa1—4 to 28 inches; dark brown (7.5YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; moderately acid; clear smooth boundary.
Oa2—28 to 41 inches; very dark grayish brown (10YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; light yellowish brown (10YR 6/4) sodium pyrophosphate extract; small accumulation of silt in lower part; moderately acid; clear smooth boundary.
Oa3—41 to 78 inches; very dark grayish brown (10YR 3/2) muck (sapric material); less than 15 percent rubbed fiber; massive; nonsticky; common fine roots; pale brown (10YR 6/3) sodium pyrophosphate extract; old reedy marsh vegetation evident in upper 6 inches before rubbing; slightly acid; abrupt smooth boundary.
IIC—78 to 80 inches; dark gray (5Y 4/1) silt; massive; sticky, nonplastic; moderately acid.

The thickness of the organic material is more than 51 inches. The soil ranges from extremely acid through slightly acid.

The Oe horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 through 3. Rubbed fiber content ranges from 20 to 50 percent and is dominantly mucky peat (hemic material).

The Oa horizon has hue of 2.5YR through 10YR, value of 2 or 3, and chroma of 1 through 3. Rubbed fiber content is less than 17 percent and is dominantly muck (sapric material).

The IIC horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 1 or 2. It is silt, silt loam, silty clay, silty clay loam, or clay.

The Dorovan soils in this survey area are a taxadjunct because they have a higher pH in the middle and lower organic layers and are redder in the upper organic layers than defined in the range for the series. These differences do not significantly affect the use and management of the soils.

Dragston series

The soils of the Dragston series are deep and somewhat poorly drained. They formed in loamy fluvial and marine sediments. The Dragston soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Dragston soils commonly are near Acredale, Backbay, Munden, Nimmo, Tetotum, and Tomotley soils. The Dragston soils are not as gray in the upper part of the argillic horizon as the Acredale, Nimmo, or Tomotley soils; have less clay in the subsoil than the Tetotum soils; have more gray near the surface than the Munden

soils; and are not flooded and do not have a histic epipedon as do the Backbay soils.

Typical pedon of Dragston fine sandy loam, about 2,000 feet south-southwest of junction of Dam Neck Road and Oceana Boulevard, and 75 feet west-northwest of Oceana Boulevard:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; few fine and common very fine roots; moderately acid; abrupt smooth boundary.

B21t—9 to 19 inches; light yellowish brown (2.5Y 6/4) sandy loam; common medium distinct brownish yellow (10YR 6/8) mottles, few fine faint light brownish gray (10YR 6/2) mottles, and few fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine roots; few sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B22t—19 to 29 inches; mottled light yellowish brown (2.5Y 6/4), light gray (10YR 7/1), strong brown (7.5YR 5/8), and red (2.5YR 4/8) sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few sand grains coated and many bridged with clay; very strongly acid; clear smooth boundary.

B3tg—29 to 38 inches; light gray (10YR 7/1) sandy loam; many medium distinct light yellowish brown (2.5Y 6/4) mottles and common fine and medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few very fine roots; few sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

Cg—38 to 60 inches; light gray (10YR 7/1) sandy loam; many medium and coarse strong brown (7.5YR 5/8) mottles and few fine prominent red (2.5YR 4/8) mottles; massive; friable, nonsticky, nonplastic; very strongly acid.

The solum thickness ranges from 25 to 50 inches. The soil in unlimed areas is very strongly acid or strongly acid. Silt content ranges from 20 to 50 percent in the textural control section.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 through 4. It is fine sandy loam, sandy loam, or loam.

Some pedons have a B1 horizon that has hue, value, and chroma similar to those of the upper part of the B2t horizon. The B1 horizon is sandy loam, fine sandy loam, or loam.

The upper part of the B2t horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 3 through 8. It is mottled. The lower part of the B2t horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 6, and has chroma of 0 through 8. It is mottled with high and low chromas. Some pedons have subhorizons that are mottled and do not have a dominant matrix color. The B2t horizon mainly is fine sandy loam, sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

The B3 horizon has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is loamy fine sand, sandy loam, or fine sandy loam. Some pedons do not have a B3 horizon.

The C horizon has hue of 10YR or 2.5Y or is neutral, has value of 4 through 7, and has chroma of 0 through 8. The C horizon is sand, loamy sand, or sandy loam.

Duckston series

The soils of the Duckston series are deep and poorly drained. They formed in sandy marine sediments. The Duckston soils are on coastal areas on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Duckston soils commonly are near Backbay, Corolla, and Newhan soils. The Duckston soils do not have a histic epipedon as do the Backbay soils, and they have more gray in the substratum than the Corolla or Newhan soils.

Typical pedon of Duckston fine sand, about 4 miles north of the North Carolina-Virginia state line and 2,500 feet west of the Atlantic Ocean:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) fine sand; single grain; loose; common fine and medium roots; few clean sand grains; extremely acid; clear smooth boundary.

C1g—4 to 15 inches; grayish brown (10YR 5/2) sand; single grain; loose; few fine roots; few black and strong brown fine mineral grains; extremely acid; gradual wavy boundary.

C2g—15 to 60 inches; gray (10YR 6/1) sand; single grain; loose; few black and strong brown fine mineral grains; extremely acid.

The thickness of the sandy horizons is more than 72 inches. The soil ranges from extremely acid through neutral. The soil has few or common mineral grains that are black, pink, strong brown, or white. Some pedons have a buried A horizon that has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is sand or fine sand.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is sand or fine sand.

The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is sand or fine sand.

Fripp series

The soils of the Fripp series are deep and excessively drained. They formed in sandy marine and eolian sediments. The Fripp soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 2 to 30 percent.

Fripp soils commonly are near Lakehurst Variant, Newhan, and Pamlico soils. Fripp soils do not have gray and reddish mottles in the substratum as do the Lakehurst Variant soils, and they have a brown cambic horizon which Newhan soils do not have. The Fripp soils are not subject to ponding and do not have an organic layer as do the Pamlico soils.

Typical pedon of Fripp sand, 2 to 30 percent slopes, about 400 feet west of the west end of 69th Street, in Seashore State Park:

A1—0 to 5 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; common very fine to coarse roots; many clear sand grains and few pink and red sand grains; extremely acid; clear smooth boundary.

A2—5 to 12 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; common very fine roots, few fine roots, and common medium roots; few pink, green, opaque, and red sand grains; extremely acid; clear smooth boundary.

Bir&C—12 to 20 inches; mottled brown (7.5YR 4/4) (Bir) and yellowish brown (10YR 5/6) (C) fine sand; single grain; loose; dark brown discontinuous pockets; (7.5YR 4/4) mainly in upper 4 inches; few very fine roots and fine and common medium roots; few clear, common opaque, few pink and common iron stained sand grains; extremely acid; gradual wavy boundary.

C1—20 to 29 inches; brownish yellow (10YR 6/6) fine sand; single grain; loose; few very fine roots and fine and common medium roots; common clear and few opaque, green, and pink sand grains; extremely acid; gradual wavy boundary.

C2—29 to 60 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; few very fine and fine roots; many clear, common opaque, and few pink and green sand grains; very strongly acid.

The thickness of the sandy horizons is more than 80 inches. The soil is extremely acid or very strongly acid. The combined silt and clay content is less than 5 percent.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 2. The A horizon is sand or fine sand.

The Bir part of the Bir&C horizon has hue of 7.5YR, value of 4 or 5, and chroma of 3 through 6. In some pedons the Bir horizon or a Bhir horizon is continuous enough to be a separate horizon. The C part of the Bir&C horizon and the upper part of the C horizon have hue of 10YR, value of 5 or 6, and chroma of 6 or 8. The lower part of the C horizon has hue of 10YR, value of 6 or 7, and chroma of 3 or 4. The Bir&C and C horizons are sand or fine sand.

The Fripp soils in this survey area are a taxadjunct because they have a weak spodic horizon at a depth of 12 to 20 inches, which is not defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Hyde series

The soils of the Hyde series are deep and very poorly drained. They formed in loamy marine and fluvial sediments. Hyde soils are on the lower part of the Coastal Plain on inland flats and in slight depressions. Slopes range from 0 to 1 percent.

Hyde soils commonly are near Acredale and Tomotley soils. The Hyde soils have an umbric epipedon, but the Acredale and Tomotley soils do not.

Typical pedon of Hyde silt loam, about 4,500 feet southwest of the intersection of Oceana Boulevard and Bells Road, and 4,300 feet northwest of the intersection of Oceana Boulevard and Harper Road:

Ap—0 to 8 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine granular structure; friable, slightly sticky, slightly plastic; many very fine and fine roots; many fine and medium pores; extremely acid; clear smooth boundary.

A12—8 to 16 inches; very dark grayish brown (2.5Y 3/2) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; common fine and medium pores; extremely acid; abrupt smooth boundary.

B21tg—16 to 28 inches; dark grayish brown (2.5Y 4/2) silty clay loam; weak medium subangular blocky structure; friable, sticky, plastic; few very fine and fine roots; many fine and medium pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

B22tg—28 to 37 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct olive yellow (2.5Y 6/6) mottles and few medium distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine and fine roots; many fine and medium pores; thin patchy clay films and silt coatings on faces of peds; extremely acid; clear smooth boundary.

B23tg—37 to 45 inches; dark grayish brown (2.5Y 4/2) silty clay; many medium distinct olive yellow (2.5Y 6/6) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; common very fine and fine pores; thin patchy clay films and silt coatings on faces of peds; extremely acid; gradual smooth boundary.

B24tg—45 to 53 inches; mottled light olive gray (5Y 6/2), olive yellow (2.5Y 6/8), and strong brown (7.5YR 5/8) silty clay loam; weak fine and medium subangular blocky structure; firm, sticky, plastic; few very fine roots; many very fine and fine pores; thin patchy clay films and silt coatings on faces of peds;

few medium flakes of mica; very strongly acid; clear smooth boundary.

B3tg—53 to 58 inches; light olive gray (5Y 6/2) loam; common medium distinct brownish yellow (10YR 6/6) mottles, few medium prominent strong brown (7.5YR 5/8) mottles, and few medium distinct olive yellow (2.5Y 6/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine and fine roots; common very fine and fine pores; thin patchy clay films and silt coatings on faces of peds; few medium flakes of mica; very strongly acid; abrupt smooth boundary.

IICg—58 to 72 inches; light gray (10YR 7/2) fine sand; single grain; loose; fluid sands in water table; very strongly acid.

The solum thickness ranges from 40 to 70 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Some pedons have few or common flakes of mica in the lower part of the B horizon and in the C horizon. Organic matter content of the A horizon ranges from 4 to 15 percent.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. It is silt loam, loam, or their mucky analogs.

The upper part of the B2tg horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 or 2. The lower part of the B2tg horizon has hue of 10YR through 5GY, value of 4 through 6, and chroma of 1 or 2 and is mottled in shades of brown or red. The B2tg horizon is silt loam or silty clay loam in the upper part and ranges from silt loam to silty clay in the lower part.

The B3tg horizon has hue, value, and chroma similar to those of the B2tg horizon. The B3tg horizon ranges from loam to silty clay.

The IIC horizon has hue of 10YR through 5Y, value of 5 through 7, and chroma of 1 or 2. It mainly is sand, fine sand, loamy sand, or sandy loam. Some pedons have thin strata of finer textured material.

The Hyde soils in this survey area are a taxadjunct because they have a higher base status in the lower part of the argillic horizon than is defined in the range for the series. This difference does not significantly affect the use and management of the soils.

Lakehurst Variant

The soils of the Lakehurst Variant are deep and moderately well drained. They formed in sandy marine and eolian sediments. The Lakehurst Variant soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 0 to 4 percent.

Lakehurst Variant soils commonly are near Fripp, Newhan, and Pamlico soils. The Lakehurst Variant soils have gray and reddish mottles in the substratum; neither the Fripp nor the Newhan soils have mottles. The Pamlico soils are subject to ponding and have an organic layer.

Typical pedon of Lakehurst Variant sand, about 5,700 feet southeast of the intersection of Shore Drive and Atlantic Avenue, 1,500 feet south of Shore Drive, in Seashore State Park:

A1—0 to 4 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; common fine and medium roots; many clear and few pink sand grains; common organic stained sand grains; extremely acid; clear smooth boundary.

A2—4 to 24 inches; light brownish gray (10YR 6/2) sand; single grain; loose; few fine and common medium and coarse roots; many clear and few pink and light brown sand grains; extremely acid; clear wavy boundary.

Bhir—24 to 32 inches; dark reddish brown (5YR 3/3) sand; single grain; loose; few fine and medium roots; common opaque few clear and pink, and many iron stained sand grains; extremely acid; gradual wavy boundary.

C1—32 to 45 inches; yellowish brown (10YR 5/6) sand; few medium distinct light gray (10YR 7/2) mottles; single grain; loose; few fine roots; few medium distinct dark reddish brown (5YR 3/2) weakly cemented brittle concretions 2 to 10 millimeters in diameter; few light brown and opaque, and common clear sand grains; very strongly acid; clear wavy boundary.

C2—45 to 53 inches; mottled yellowish brown (10YR 5/6) and dark reddish brown (5YR 3/3) sand; single grain; loose; darker material is stratified, pocketed, and weakly cemented; few light brown and common clear and iron stained sand grains; very strongly acid; gradual wavy boundary.

C3—53 to 72 inches; mottled yellowish brown (10YR 5/4) and yellowish red (5YR 5/8) sand; single grain; loose; few light brown and common clear and iron stained sand grains; very strongly acid.

The thickness of the sandy horizons is more than 80 inches. The soil is extremely acid or very strongly acid. The combined silt and clay content is less than 5 percent.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The A horizon is sand or fine sand.

The Bhir horizon has hue of 5YR through 10YR, value of 3 through 5, and chroma of 3 through 5. It is sand or fine sand.

The upper part of the C horizon has hue of 5YR through 10YR, value of 5 or 6, and chroma of 6 or 8. Some pedons have concretions. The lower part of the C horizon has hue of 5YR through 10YR, value of 3 through 7, and chroma of 2 through 8. The lower part of the C horizon commonly has high- or low-chroma

mottles and weakly cemented concretions. The C horizon is sand or fine sand.

Munden series

The soils of the Munden series are deep and moderately well drained. They formed in loamy fluvial and marine sediments. The Munden soils are on inland ridges on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Munden soils commonly are near Bojac, Dragston, and Nimmo soils. The Munden soils have less gray in the argillic horizon than the Dragston or Nimmo soils. The Munden soils have brown and gray mottles in the argillic horizon, whereas the Bojac soils do not have mottles in the argillic horizon.

Typical pedon of Munden fine sandy loam, about 1-1/4 miles southwest of Princess Anne and 4-1/4 miles southeast of Stumpy Lake, 136 feet due south of North Landing Road and 100 feet southeast of a small cemetery:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

B21t—8 to 15 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; strongly acid; clear smooth boundary.

B22t—15 to 25 inches; yellowish brown (10YR 5/6) loam; common medium faint light brown (7.5YR 6/4) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

B23t—25 to 32 inches; brown (10YR 5/3) and yellowish brown (10YR 5/8) sandy loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; few small pockets of sand up to 1-1/2 inches in diameter; very strongly acid; clear smooth boundary.

C—32 to 62 inches; mottled yellowish brown (10YR 5/8), light brownish gray (10YR 6/2), and yellowish red (5YR 5/6) sand; single grain; loose; many stained sand grains; strongly acid.

The solum thickness ranges from 25 to 45 inches. The soil in unlimed areas ranges from very strongly acid through moderately acid. Silt content ranges from 20 to 40 percent in the textural control section.

The Ap or A1 horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 1 through 4. Some pedons have an A1 horizon that has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 2 through 4. The A horizon is sandy loam, fine sandy loam, or loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. It is sandy loam, fine sandy loam, or loam.

The B2t horizon has hue of 7.5YR through 2.5Y, value of 3 through 6, and chroma of 4 through 8. It mainly is sandy loam, fine sandy loam, or loam. Some pedons have a thin subhorizon of sandy clay loam.

Some pedons have a B3 horizon that has hue, value, and chroma similar to those of the B2t horizon, or it is mottled with high and low chromas without a dominant matrix color. It is sandy loam, fine sandy loam, or loamy sand.

The C horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is sand, fine sand, loamy sand, or loamy fine sand.

Nawney series

The soils of the Nawney series are deep and very poorly drained. They formed in loamy fluvial sediments. The Nawney soils are in inland drainageways and on flood plains on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Nawney soils commonly are near Acredale, Backbay, Dorovan, Nimmo, Pocaty, Rappahannock, and Tomotley soils. The Nawney soils are flooded frequently; the Acredale, Nimmo, and Tomotley soils usually are not flooded. The Backbay soils have an organic surface layer and support marsh vegetation, and the Pocaty and Dorovan soils are deep organic soils. The Nawney soils are flooded with freshwater and are wooded; the Rappahannock soils are flooded daily with saline water and support only marsh vegetation.

Typical pedon of Nawney silt loam, about 3,200 feet south of the junction of Princess Anne Road and Holland Road and about 4,500 feet southwest of the junction of Princess Anne Road and Seaboard Road:

O2—4 inches to 0; partially decomposed roots, leaves, and twigs and highly decomposed very dark grayish brown (10YR 3/2) organic material; many very fine and medium roots; very strongly acid; abrupt wavy boundary.

A1—0 to 5 inches; dark gray (10YR 4/1) silt loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak fine granular structure; very friable; slightly sticky, slightly plastic; many fine and medium roots; strongly acid; clear wavy boundary.

C1g—5 to 43 inches; gray (10YR 6/1) loam; massive; friable; slightly sticky, slightly plastic; common fine and medium roots; strongly acid; gradual wavy boundary.

C2g—43 to 60 inches; gray (10YR 6/1) stratified sand, loamy sand, and sandy loam; massive; slightly sticky, slightly plastic; strongly acid.

The loamy horizons extend to a depth of 40 to 60 inches. The soil ranges from extremely acid through strongly acid above a depth of 40 inches and from extremely acid through slightly acid below 40 inches. Some pedons have one or more buried A horizons.

The A horizon has hue of 7.5YR through 5Y or is neutral, has value of 2 through 5, and has chroma of 0 through 2. Some pedons have high-chroma mottles. The A horizon commonly is fine sandy loam, sandy loam, loam, or silt loam but ranges to loamy sand, sandy clay loam, clay loam, and silty clay loam.

The C horizon has hue of 10YR through 5GY or is neutral, has value of 4 through 7, and has chroma of 0 through 2. Some pedons have high-chroma mottles, and some pedons are highly variegated with high- and low-chroma mottles. The C horizon above a depth of 40 inches commonly is sandy loam, fine sandy loam, loam, sandy clay loam, clay loam, or silty clay loam. Pockets or strata of coarser or finer textured material are in some pedons. Below 40 inches the C horizon commonly is highly stratified and ranges from sand to clay.

Newhan series

The soils of the Newhan series are deep and excessively drained. They formed in sandy marine and eolian sediments. The Newhan soils are on coastal dunes on the lower part of the Coastal Plain. Slopes range from 2 to 30 percent.

Newhan soils commonly are near Corolla, Duckston, Lakehurst Variant, and Fripp soils. The Newhan soils do not have mottles or gray in the substratum as do the Corolla, Lakehurst Variant, and Duckston soils. The Newhan soils do not have a brown cambic horizon as do the Fripp soils.

Typical pedon of Newhan fine sand, 2 to 30 percent slopes, about 2.3 miles north of the North Carolina-Virginia state line, 300 feet west of the Atlantic Ocean:

A1—0 to 3 inches; grayish brown (10YR 5/2) fine sand; single grain; loose; common very fine and fine roots; common sand grains stained with organic material; few pink and red sand grains; extremely acid; clear smooth boundary.

C—3 to 72 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; common opaque, pink, white, and strong brown sand grains; extremely acid.

The sandy material extends to a depth of more than 72 inches. The soil ranges from extremely acid through neutral. The combined content of silt and clay is less than 5 percent.

The A horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is sand or fine sand. Some pedons do not have an A horizon.

The C horizon has hue of 10YR, value of 6 or 7, and chroma of 1 through 4. It is sand or fine sand.

Nimmo series

The soils of the Nimmo series are deep and poorly drained. They formed in loamy fluvial and marine sediments overlying sandy sediments. The Nimmo soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Nimmo soils commonly are near Acredale, Backbay, Dragston, Munden, Nawney, Tomotley, and Portsmouth soils. The Nimmo soils have less silt and clay in the argillic horizon than the Acredale soils, have more gray in the argillic horizon than the Dragston or Munden soils, and have less clay in the argillic horizon than the Tomotley soils. The Nimmo soils are not subject to flooding as are the Nawney and Backbay soils, and they do not have an umbric epipedon as do the Portsmouth soils.

Typical pedon of Nimmo loam, 4.5 miles south of Pungo, about 0.85 mile southeast of the junction of Vaughan Road and Princess Anne Road, and 0.8 mile northeast of the junction of Mill Landing Road and Princess Anne Road:

Ap—0 to 7 inches; dark gray (10YR 4/1) loam; weak fine granular structure; friable, nonsticky, slightly plastic; many fine roots; common clean sand grains; strongly acid; abrupt smooth boundary.

B21tg—7 to 14 inches; light gray (10YR 6/1) fine sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; many fine and few medium and coarse roots; many sand grains coated and bridged with clay; strongly acid; clear smooth boundary.

B22tg—14 to 25 inches; gray (10YR 5/1) loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine medium and coarse roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary.

B23tg—25 to 33 inches; gray (10YR 5/1) fine sandy loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and medium roots; many sand grains coated and bridged with clay; few thin discontinuous clay films on faces of peds; very strongly acid; clear smooth boundary.

IICg—33 to 60 inches; light gray (10YR 7/1) fine sand; single grain; loose; common very fine black mineral grains; few medium yellowish brown (10YR 5/4) sand grains; few coarse sand grains; strongly acid.

The solum thickness ranges from 25 to 45 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Silt content ranges from 20 to 50 percent in the textural control section.

The A1 or Ap horizon has hue of 10YR through 5Y, value of 3 through 5, and chroma of 1 or 2. Where value is 3, the A horizon is less than 6 inches thick. The A horizon is sandy loam, fine sandy loam, or loam.

The Btg horizon has hue of 10YR through 5Y, value of 4 through 7, and chroma of 1 or 2. It commonly is loam, fine sandy loam, or sandy loam. Some pedons have thin layers of silt loam or sandy clay loam.

The IIC horizon has hue of 7.5YR through 5Y or is neutral, has value of 3 through 8, and has chroma of 0 through 8. It is sand, loamy sand, or fine sand.

Pamlico series

The soils of the Pamlico series are deep and very poorly drained. They formed in partially decomposed organic matter over sandy marine sediments. The Pamlico soils are in depressions between coastal dunes on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Pamlico soils commonly are near Fripp, Lakehurst Variant, and Rappahannock soils. The Pamlico soils have water on the surface and have an organic layer; the Fripp and Lakehurst Variant soils do not. The Pamlico soils are wooded and are ponded with freshwater; the Rappahannock soils are flooded daily with saltwater and support only marsh vegetation.

Typical pedon of Pamlico mucky peat, ponded, about 6,400 feet south-southeast of the junction of Igloo Road and Shore Drive, in the central part of Seashore State Park:

Oe—0 to 6 inches; very dark brown (10YR 2/2) mucky peat (hemic material) consisting of partially decomposed roots, leaves, twigs, and moss; about 40 percent rubbed fiber; friable; extremely acid; gradual wavy boundary.

Oa—6 to 30 inches; very dark brown (10YR 2/2) muck (sapric material); about 4 percent rubbed fiber; massive; friable; dark yellowish brown (10YR 3/4) sodium pyrophosphate extract; extremely acid; gradual wavy boundary.

IIC—30 to 60 inches; dark grayish brown (10YR 4/2) sand; single grain; loose, nonsticky, nonplastic; very strongly acid.

The thickness of the organic material ranges from 16 to 40 inches. The soil is extremely acid in the organic layers and ranges from extremely acid through strongly acid in the mineral layer.

The Oe horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Rubbed fiber content ranges from 20 to 50 percent.

The Oa horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 2 or 3. Rubbed fiber content is less than 17 percent. Sodium pyrophosphate color test results typically are 10YR 3/4, 4/4, 6/4, or 5/4.

The IIC horizon has hue of 10YR, value of 3 through 5, and chroma of 2. It is sand or loamy sand.

Pocaty series

The soils of the Pocaty series are deep and very poorly drained. They formed in partially decomposed plant remains and are in the lower part of the Coastal Plain. Slopes range from 0 to 1 percent.

Pocaty soils commonly are near Dorovan and Nawney soils. The Pocaty soils have a high content of sulfur, which is not characteristic of the Dorovan or Nawney sils. The Pocaty soils support marsh vegetation, whereas the Dorovan and Nawney soils are wooded.

Typical pedon of Pocaty peat, about 4,800 feet east of the intersection of Indian Creek Road and Blackwater Road, 900 feet north of Milldam Creek:

Oi—0 to 12 inches; very dark brown (10YR 2/2) peat (fibric material) comprised of partially decomposed leaves, stems, and roots; about 75 percent fiber rubbed; massive; many fine and medium roots; weak sulfide odor; strongly acid; gradual smooth boundary.

Oe—12 to 20 inches; very dark brown (10YR 2/2) mucky peat (hemic material); about 35 percent fiber rubbed; massive; many fine and medium roots; moderate sulfide odor; moderately acid; clear smooth boundary.

Oa1—20 to 41 inches; black (10YR 2/1) muck (sapric material); about 15 percent fiber rubbed; massive; common fine and medium roots; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

Oa2—41 to 48 inches; black (10YR 2/1) muck (sapric material); less than 5 percent fiber rubbed; massive; few fine and medium roots; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

Oa3—48 to 60 inches; dark gray (10YR 4/1) muck (sapric material); less than 5 percent fiber rubbed; massive; flows easily between fingers when squeezed; moderate sulfide odor; slightly acid; clear smooth boundary.

IICg—60 to 80 inches; dark gray (10YR 4/1) silt loam; massive; slightly sticky, nonplastic; flows easily between fingers when squeezed; slightly acid.

The thickness of the organic layers is more than 51 inches. The soil ranges from very strongly acid through neutral in its natural state. The sulfur content ranges from 0.75 percent to about 4 percent in individual layers within a depth of 40 inches. The organic materials are

mainly from herbaceous plants. Mineral strata less than 12 inches thick are in the control section of some pedons.

The surface tier has hue of 7.5YR through 5Y, value of 2 through 4, and chroma of 1 through 3. It commonly is mucky peat (hemic) or peat (fibric) but ranges to muck (sapric) in some pedons.

The subsurface tier and the bottom tier have hue of 7.5YR through 5Y or are neutral, have value of 2 through 4, and have chroma of 0 through 4. They dominantly are muck (sapric) but are mucky peat (hemic material) in the upper part of most pedons.

The IICg horizon has hue of 7.5YR through 5Y or is neutral, has value of 2 through 6, and has chroma of 0 through 4. It commonly is loamy but ranges from sandy to clayey.

Portsmouth series

The soils of the Portsmouth series are deep and very poorly drained. They formed in loamy marine and fluvial sediments overlying sandy sediments. The Portsmouth soils are in inland depressions and on flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Portsmouth soils commonly are near Acredale, Nimmo, and Tomotley soils. The Portsmouth soils have an umbric epipedon; the Acredale, Nimmo, and Tomotley soils have an ochric epipedon.

Typical pedon of Portsmouth loam, about 3,650 feet southeast of the junction of Gum Bridge and Charity Neck Roads, 4,000 feet northeast of the junction of Charity Neck and Nawney Creek Roads:

A1—0 to 13 inches; very dark gray (10YR 3/1) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; many fine pores; extremely acid; clear smooth boundary.

B21tg—13 to 21 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common very fine and few fine roots; few fine pores; few sand grains coated and bridged with clay; extremely acid; clear wavy boundary.

B22tg—21 to 25 inches; grayish brown (2.5Y 5/2) silt loam; few medium faint light yellowish brown (10YR 6/4) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine and common very fine pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

IIB23tg—25 to 32 inches; dark brown (10YR 4/2) sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common very fine and fine pores; thin patchy clay films on faces of peds; extremely acid; clear smooth boundary.

IIB3tg—32 to 36 inches; grayish brown (10YR 5/2) sandy loam; many coarse distinct brownish yellow (10YR 6/6) mottles and few fine prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; firm, slightly sticky, plastic; few fine roots; common very fine and fine pores; few sand grains coated and bridged with clay; thin layer of silty clay loam in lower part; extremely acid; clear smooth boundary.

IIC1—36 to 42 inches; mottled olive yellow (2.5Y 6/6), grayish brown (2.5Y 5/2), and light gray (10YR 7/2) sand; single grain; loose; extremely acid; abrupt smooth boundary.

IIC2—42 to 60 inches; stratified light gray (10YR 7/1), yellowish brown (10YR 5/8), and gray (N 6/0) stratified loamy sand and sandy loam; sandy loam is massive, friable, and slightly plastic; loamy sand is single grain, loose, nonsticky, and nonplastic; extremely acid.

The solum thickness ranges from 25 to 40 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or fine sandy loam.

Some pedons have a B1tg horizon that has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 or 2. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 or 2. Some pedons have high-chroma mottles throughout. The B2tg horizon mainly is loam, silt loam, or sandy loam. Some pedons have a thin subhorizon that is sandy clay loam or silty clay loam.

The B3tg horizon has hue, value, and chroma similar to those of the B2tg horizon. The B3tg horizon is sandy loam or loamy sand. Some pedons do not have a B3tg horizon.

The IIC horizon has hue of 10YR through 2.5Y or is neutral, has value of 5 through 7, and has chroma of 0 through 2. In some pedons it is mottled or variegated in bright colors. It mainly is sand or loamy sand. Some pedons have strata of finer textured material.

Psamments

Psamments in this survey area consist mostly of well drained and moderately well drained, sandy material that has been disturbed during excavation, grading, or filling. The soil from the excavated areas has been used as foundation material for roads, buildings, or similar uses. Many of the fill areas consist of stockpiled material from dredging operations. Some fill areas contain nonsoil materials such as stumps and old building materials. Many other areas of Psamments consist of dune land that has been altered and landscaped for use as military bases or for urban development. Slopes range from

nearly level to steep; some areas are complex or undulating.

Psamments commonly are near undisturbed Corolla, Duckston, Fripp, and Newhan soils.

A typical pedon is not given for Psamments because of their variability. The depth of the fill areas ranges from 20 inches to at least 30 feet. The soil material has hue of 7.5YR or 10YR, value of 4 through 8, and chroma of 1 through 4. It is sand, fine sand, or loamy sand. Reaction ranges from extremely acid to moderately acid.

Rappahannock series

The soils of the Rappahannock series are deep and very poorly drained. They formed from partially decomposed organic materials and strata of loamy marine and fluvial sediments. The Rappahannock soils are in tidal marshes on the lower part of the Coastal Plain. Slopes are less than 1 percent.

Rappahannock soils commonly are near Nawney and Pamlico soils. Rappahannock soils are flooded daily with saline water and support marsh vegetation; the Nawney and Pamlico soils are not flooded and are wooded.

Typical pedon of Rappahannock mucky peat, strongly saline, about 3,600 feet east of the junction of Kings Grant Road and Winchester Lane, 4,000 feet north-northeast of the junction of Virginia Beach Boulevard and North Lynnhaven Road:

Oe—0 to 11 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material); about 44 percent fiber rubbed; massive; nonsticky; many fine and medium roots; strong sulfur odor; moderately alkaline; clear smooth boundary.

Oa1—11 to 37 inches; very dark grayish brown (10YR 3/2) muck (sapric material); about 10 percent fiber rubbed; massive; nonsticky; common fine and medium roots; flows easily between fingers when squeezed; strong sulfur odor; moderately alkaline; abrupt smooth boundary.

IIC—37 to 51 inches; dark greenish gray (5GY 4/1) silt loam; massive; slightly sticky, nonplastic; flows easily between fingers when squeezed; moderately alkaline; abrupt smooth boundary.

IIIOa2—51 to 80 inches; black (10YR 2/1) muck (sapric material); about 12 percent fiber rubbed; massive; flows easily between fingers when squeezed; strong sulfur odor; moderately alkaline.

Sulfur content is more than 0.75 percent in one or more horizons within 40 inches of the surface. The organic layers of the control section are dominantly sapric material; hemic material is in the surface tier of most pedons. Mineral strata at least 12 inches thick are within 51 inches of the surface. Reaction ranges from neutral to moderately alkaline throughout the profile. After drying, reaction ranges from very strongly acid to moderately acid.

The organic material in all tiers has hue of 10YR through 5Y or is neutral, has value of 2 or 3, and has chroma of 0 through 2. It is muck (sapric material) or mucky peat (hemic material).

The mineral strata have hue of 10YR through 5GY, value of 3 through 5, and chroma of 1 or 2. They are silt loam, silty clay loam, loamy sand, or sandy loam.

Rappahannock soils in this survey area are a taxadjunct because they are inundated daily by water which contains more salt than defined in the range for the series. This does not significantly affect the use and management of the soils.

Rumford series

The soils of the Rumford series are deep and well drained. They formed in sandy fluvial and marine sediments. The Rumford soils are on side slopes on inland areas on the lower part of the Coastal Plain. Slopes range from 6 to 35 percent.

Rumford soils commonly are near State, Tetotum, and Yeopim soils. Rumford soils have less clay in the argillic horizon and are steeper than any of those soils.

Typical pedon of Rumford fine sandy loam, 6 to 35 percent slopes, 2,700 feet northeast of the intersection of First Colonial Road and Old Donation Parkway, and 6,000 feet southeast of the intersection of First Colonial Road and Great Neck Road:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) fine sandy loam; weak fine granular structure; friable, nonsticky, nonplastic; many very fine and common fine medium and coarse roots; common fine pores; extremely acid; clear smooth boundary.

A2—3 to 10 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few fine and common medium and coarse roots; common medium and fine pores; extremely acid; gradual wavy boundary.

B21t—10 to 16 inches; strong brown (7.5YR 5/6) sandy clay loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common fine and medium pores; many sand grains coated and bridged with clay; extremely acid; clear smooth boundary.

B22t—16 to 27 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; few fine pores; many sand grains coated and bridged with clay; few pockets up to 2 inches in diameter of brownish yellow (10YR 6/6) loamy coarse sand; very strongly acid; clear smooth boundary.

B23t—27 to 41 inches; strong brown (7.5YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable, nonsticky, slightly plastic; few fine

roots; few fine pores; many sand grains coated and bridged with clay; few pockets up to 1 inch in diameter of brownish yellow (10YR 6/6) loamy coarse sand; very strongly acid; gradual wavy boundary.

B3—41 to 46 inches; strong brown (7.5YR 5/6) loamy fine sand; weak medium subangular blocky structure; friable, nonsticky, nonplastic; few fine pores; few pockets up to 1 inch in diameter of brownish yellow (10YR 6/6) loamy coarse sand, strongly acid; clear wavy boundary.

C1—46 to 54 inches; yellowish brown (10YR 5/8) fine sand; single grain; loose; few strata of strong brown (7.5YR 5/6) fine sand; strongly acid; clear wavy boundary.

C2—54 to 72 inches; light yellowish brown (10YR 6/4) fine sand; few fine distinct light gray (10YR 6/1) mottles; single grain; loose; strongly acid.

The solum thickness ranges from 30 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A1 horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. It is loamy sand, sandy loam, or fine sandy loam.

The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is loamy sand, sandy loam, or fine sandy loam. Some pedons do not have an A2 horizon.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. It is sandy loam, fine sandy loam, or sandy clay loam.

The B3 horizon has hue, value, and chroma similar to those of the B2t horizon and is loamy sand, loamy fine sand, fine sandy loam, or sandy loam.

The C horizon has hue of 10YR, value of 5 through 8, and chroma of 4 through 8. It is sand, fine sand, sandy loam, or very fine sandy loam.

The Rumford soils in this survey area are a taxadjunct because they have more weatherable minerals in the control section than is defined in the range for the series. This difference does not affect the use and management of the soils.

State series

The soils of the State series are deep and well drained. They formed in loamy fluvial and marine sediments. The State soils are on uplands and side slopes on inland areas on the lower part of the Coastal Plain. Slopes range from 0 to 6 percent.

State soils commonly are near Bojac, Tetotum, Rumford, and Yeopim soils. The State soils have more clay in the subsoil than the Bojac soils, do not have gray mottles in the argillic horizon as do the Tetotum and Yeopim soils, and have more clay in the subsoil than the Rumford soils and are not as steep.

Typical pedon of State loam, 0 to 2 percent slopes, about 110 feet east-northeast of intersection of First Colonial Road and Old Donation Parkway, and 2,100 feet southeast of the intersection of Mill Dam Road and First Colonial Road:

Ap—0 to 11 inches; dark brown (10YR 4/3) loam; weak fine granular structure; friable, slightly sticky, nonplastic; many fine and common medium roots; strongly acid; abrupt smooth boundary.

B21t—11 to 25 inches; strong brown (7.5YR 5/6) loam; weak fine and medium subangular blocky structure; friable, sticky, slightly plastic; common fine and medium roots; common thin discontinuous clay films on faces of peds; few krotovinas up to 1/2 inch in diameter filled with Ap material; very strongly acid; gradual smooth boundary.

B22t—25 to 33 inches; strong brown (7.5YR 5/6) loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine roots; common thin discontinuous clay films on faces of peds; few krotovinas up to 1/2 inch in diameter filled with Ap material; very strongly acid; gradual smooth boundary.

B23t—33 to 47 inches; yellowish brown (10YR 5/6) loam; few coarse distinct strong brown (7.5YR 5/6) stains; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; common thin discontinuous clay films on faces of peds; clay bridging between sand grains; very strongly acid; gradual smooth boundary.

B3t—47 to 56 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, nonplastic; few fine roots; few weak clay bridging between sand grains; very strongly acid; gradual smooth boundary.

C—56 to 64 inches; yellowish brown (10YR 5/6) sandy loam; massive; very friable, nonsticky, nonplastic; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas is very strongly acid or strongly acid in the A and B horizons and ranges from very strongly acid through moderately acid in the C horizon.

The A horizon has hue mainly of 7.5YR or 10YR, value of 3 through 6, and chroma of 2 through 6. Where value is 3 and chroma is 2 or 3, the thickness of the A horizon is 6 inches or less. The A horizon is sandy loam, fine sandy loam, loam, or silt loam.

Some pedons have a B1 horizon that has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. In some pedons the lower part of the B2t horizon is mottled and includes matrix hue of 2.5Y. The B2t horizon is sandy clay loam, clay loam, loam, sandy loam, or silt loam.

The B3 horizon has hue, value, and chroma similar to those of the B2t horizon and in some pedons is mottled. The B3 horizon is loam, sandy clay loam, or sandy loam.

The C or IIC horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. It is mottled in some pedons. The C horizon is sand, loamy sand, or sandy loam. It is stratified in some pedons.

Tetotum series

The soils of the Tetotum series are deep and moderately well drained. They formed in loamy fluvial and marine sediments. The Tetotum soils are on ridges and side slopes in inland areas on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Tetotum soils commonly are near Augusta, Bojac, Chapanoke, State, Rumford, and Yeopim soils. The Tetotum soils have more brown in the upper part of the B horizon than the Augusta soils. The Tetotum soils have gray mottles in the argillic horizon; the Bojac, State, and Rumford soils do not have gray mottles in the argillic horizon. The Tetotum soils have less silt in the argillic horizon than the Chapanoke or Yeopim soils.

Typical pedon of Tetotum loam, about 3,100 feet north-northwest of junction of Indian River Road and West Neck Road and 6,700 feet south-southeast of West Neck Road and North Landing Road:

Ap—0 to 10 inches; brown (10YR 4/3) loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; common fine roots; few fine pores; few krotovinas filled with worm casts; strongly acid; clear smooth boundary.

B1t—10 to 15 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; few thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B21t—15 to 20 inches; yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; few thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—20 to 26 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B23t—26 to 36 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; common medium distinct strong brown (7.5YR 5/8) mottles and many medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; clear smooth boundary.

B3t—36 to 58 inches; mottled yellowish brown (10YR 5/6), pale brown (10YR 6/3), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/8) loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine roots; few fine tubular pores; common thin discontinuous clay films on faces of peds; strongly acid; gradual smooth boundary.

IIC—58 to 70 inches; mottled pale brown (10YR 6/3), reddish yellow (7.5YR 6/8), and light brownish gray (10YR 6/2) loamy sand; massive; very friable, nonsticky, nonplastic; many clean sand grains; strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The A1 or Ap horizon has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 3 or 4. Some pedons have an A2 horizon that has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 4. The A horizon is fine sandy loam, loam, or silt loam.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 3 through 6. It is fine sandy loam or loam. Some pedons do not have a B1 horizon.

The upper part of the B2t horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 4 through 8. The lower part of the B2t horizon has matrix hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8. It has high- and low-chroma mottles. In some pedons the lower part of the B2t horizon is mottled in high and low chromas and does not have a dominant matrix color. The B2t horizon typically is clay loam or loam, but some pedons have thin subhorizons of sandy clay loam or silt loam.

Most pedons have a B3 horizon that has hue, value, and chroma similar to those of the lower part of the B2t horizon. The B3 horizon is sandy loam, sandy clay loam, or loam.

The IIC horizon has hue of 7.5YR through 5Y, value of 5 through 7, and chroma of 1 through 8, or it is mottled and does not have dominant matrix color. It is sand, loamy sand, sandy loam, or sandy clay loam.

Tomotley series

The soils of the Tomotley series are deep and poorly drained. They formed in loamy marine and fluvial sediments. Tomotley soils are on inland flats on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Tomotley soils commonly are near Acredale, Augusta, Backbay, Dragston, Hyde, Nawney, Nimmo, and Portsmouth soils. The Tomotley soils have more sand

and less silt in the argillic horizon than the Acredale soils, have more gray in the argillic horizon than the Augusta or Dragston soils, and have more clay in the argillic horizon than the Nimmo soils. The Tomotley soils are not subject to flooding as are the Nawney and Backbay soils, and they do not have an umbric epipedon as do the Hyde and Portsmouth soils.

Typical pedon of Tomotley loam, about 2,100 feet North of Indian River Road, 2,000 feet west of West Neck Road, 3,000 feet north of the junction of Indian River Road and West Neck Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam; weak fine granular structure; friable, slightly sticky, slightly plastic; common very fine and fine roots; few fine pores; moderately acid; abrupt smooth boundary.

B21tg—7 to 31 inches; gray (10YR 6/1) and light brownish gray (10YR 6/2) loam; common fine and medium distinct yellowish brown (10YR 5/8) mottles and common coarse distinct light yellowish brown (2.5Y 6/4) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine and fine roots; common fine and medium pores; common sand grains coated and bridged with clay; very strongly acid; gradual smooth boundary.

B22tg—31 to 45 inches; gray (10YR 6/1) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) mottles and common coarse prominent brownish yellow (10YR 6/6) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few very fine roots; few fine pores; few thin discontinuous clay films on faces of peds; many sand grains coated and bridged with clay; very strongly acid; clear smooth boundary.

IICg—45 to 66 inches; light brownish gray (10YR 6/2) and light gray (2.5Y 7/2) loamy sand; many coarse distinct pale yellow (2.5Y 7/4) mottles and common medium prominent brownish yellow (10YR 6/8) mottles; massive; very friable, nonsticky, nonplastic; many clean sand grains; small pockets of white sand and gray sandy loam; few fine flakes of mica; very strongly acid.

The solum thickness ranges from 40 to 60 inches. The soil in unlimed areas ranges from extremely acid through strongly acid.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 through 4, and chroma of 1 or 2. It is sandy loam, loam, or silt loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 4 through 7, and chroma of 1 or 2. It is sandy loam, fine sandy loam, loam, or silt loam.

The B2t horizon has hue of 10YR through 5Y or is neutral, has value of 4 through 6, and has chroma of 0 through 2. It is loam, clay loam, sandy clay loam, silt loam, or silty clay loam.

Some pedons have a B3 horizon that has hue of 10YR through 5Y or is neutral, has value of 5 through 7, and has chroma of 0 through 2. In most pedons it has high- and low-chroma mottles. It is fine sandy loam, loam, sandy clay loam, or silt loam.

The IICg horizon has hue of 10YR through 5GY or is neutral, has value of 6 or 7, has chroma of 0 through 2, and is mottled. It ranges mainly from sand to sandy clay loam or loam. Some pedons are stratified, and some have strata of silty clay or silty clay loam.

Udorthents

Udorthents consist of areas where the natural soil has been altered by excavation or covered by earthy fill material. The areas are well drained or moderately well drained. The excavated areas mainly are borrow pits from which the soil has been removed and used as foundation material for roads or buildings. In some areas the exposed substratum of the excavated soil is sand or loamy sand. The fill areas are sites where at least 20 inches of earthy fill material covers the natural soil or where borrow pits, dumps, natural drainageways, or low-lying areas have been filled. Slopes range from nearly level to steep, and some areas are undulating.

A typical pedon is not given for these soils because of their variability. The fill areas mainly are more than 20 inches deep and are as thick as 30 to 40 feet in places. Many areas have inclusions of nonsoil material, such as concrete, wood, glass, and asphalt. The soils are very stratified and are variable in color and texture.

Udorthents have hue of 7.5YR through 5G, value of 4 through 7, chroma of 3 through 8. The texture is variable and ranges from sandy loam to silty clay loam. The material ranges from extremely acid through slightly acid.

Yeopim series

The soils of the Yeopim series are deep and moderately well drained. They formed in loamy marine and fluvial sediments. The Yeopim soils are on uplands on the lower part of the Coastal Plain. Slopes range from 0 to 2 percent.

Yeopim soils commonly are near Acredale, Augusta, Chapanoke, State, Tetotum, and Rumford soils. The Yeopim soils have more brown in the upper part of the argillic horizon than the Acredale, Augusta, or Chapanoke soils and have more silt in the argillic horizon than the Tetotum soils. The Yeopim soils have gray mottles in the argillic horizon; the State and Rumford soils do not have gray mottles.

Typical pedon of Yeopim silt loam, about 4,200 feet east-northeast of junction of Mill Dam Road and First Colonial Road and 3,800 feet northeast of the junction of Old Donation Parkway and First Colonial Road:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable; slightly sticky, nonplastic; common fine and medium roots; few fine pores; extremely acid; abrupt smooth boundary.

A2—3 to 8 inches; light yellowish brown (2.5Y 6/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common fine medium and coarse roots; common fine pores; extremely acid; clear smooth boundary.

B21t—8 to 23 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common fine and few medium roots; common fine and very fine pores; few thin discontinuous clay films on faces of peds; extremely acid; clear wavy boundary.

B22t—23 to 33 inches; light olive brown (2.5Y 5/4) silty clay loam; common medium distinct brownish yellow (10YR 6/6) and gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine and medium roots; common fine pores; many thin continuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

B23t—33 to 79 inches; mottled gray (10YR 5/1), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/8) silty clay loam; weak coarse prismatic structure parting to weak medium subangular blocky; firm, slightly sticky, slightly plastic; few fine and medium roots along faces of prisms; few fine pores; many thick continuous clay films on faces of peds; very strongly acid; clear smooth boundary.

IIC—79 to 84 inches; yellowish brown (10YR 5/6) loamy sand; massive; very friable, nonsticky, nonplastic; strongly acid.

The solum thickness is more than 40 inches. The soil in unlimed areas ranges from extremely acid through strongly acid. Common to many fine flakes of mica are in the lower part of the solum in most pedons.

The A1 horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 through 4. The A2 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 through 6. The A horizon is loam or silt loam.

Some pedons have a B1 horizon that has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 through 8. It is loam or silt loam.

The upper part of the B2t horizon has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 4 through 8. The lower part of the B2t horizon has hue, value, and chroma similar to those of the upper part but has chroma of 1 or 2. In most pedons the lower part of the B2t horizon does not have a dominant matrix color. The B2t horizon typically is clay loam, silt loam, or silty clay loam. Some pedons are silty clay or loam in the lower part.

Some pedons have a B3 horizon that has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 5. Mottles of high contrast range from few to many. The B3 horizon is fine sandy loam, very fine sandy loam, silt loam, sandy clay loam, or loam.

The C or IIC horizon has hue of 10YR or 2.5Y, value of 5 through 7, and chroma of 1 through 6. It is sand, loamy sand, sandy loam, or fine sandy loam.

Formation of the Soils

This section describes the factors and processes that have affected the formation and morphology of the soils in the City of Virginia Beach.

Factors of Soil Formation

Soils are formed through the interaction of five major factors: parent material, climate, plant and animal life, relief, and time. The relative influence of each factor varies from place to place, and in some places one factor dominates the formation of a soil and determines most of its properties and characteristics.

Parent Material

Parent material is the material from which soils form. Most of the soils in the City of Virginia Beach formed in layers of marine and fluvial sediments that mainly are 2,000 to 5,000 feet thick over bedrock. These sediments range in texture from sand to clay. The texture of the sediments is a reflection of the environment in which they were deposited thousands of years ago. In shallow, backwater areas where the water was very still, fine textured silt and clay particles settled to the bottom and accumulated. As the level of the ocean would rise and fall at any given site, the environment of deposition would also vary, thereby resulting in the accumulation of sediments in layers of differing texture. These horizontal layers range in thickness from less than an inch to many feet. The soils of the survey area formed in the uppermost layers, commonly in the sediments at a depth of 3 to 6 feet.

Soils inherit many chemical and physical properties from their parent material. For example, soils formed on relic beaches, such as Pungo Ridge, have a loamy texture. The Bojac, Munden, and Dragston soils typically formed in these settings. Soils formed on broad flats once covered by shallow bays have a silty texture. An example of such broad flats can be observed west of Princess Anne Courthouse on Princess Anne Road. Acredale soils are commonly on these flats. In most parts of the survey area the soils are underlain mostly by sandy sediments, usually at a depth of 4 to 6 feet. In some areas this sandy material has pockets or thin strata of finer textured sediments.

Some soils in the City of Virginia Beach reflect an environment of deposition that occurred in fast-moving water. This is most evident in the northwestern corner of the survey area, dominantly in the Bayside Borough. Most soils in this area have rounded gravel up to 3/4 inch in diameter. These coarse fragments generally are more abundant in the substratum of the soils, but can occur throughout the profile and generally are evident on the surface.

Other soils in the City of Virginia Beach have developed predominantly in sandy sediments. The Newhan, Corolla, and Fripp soils along the coastal areas are typical of soils that formed from eolian and water-washed sediments.

Although the dominant parent material of most soils in the survey area is marine and fluvial sediments, some have developed from partially decomposed plant materials. Pamlico soils formed from herbaceous and woody plant remains in depressions and troughs in the Cape Henry area. Pocaty and Rappahannock soils formed from herbaceous marsh vegetation. All of these organic soils formed under saturated or ponded conditions that allowed only minimal decomposition of plant materials.

Climate

This survey area has a humid, mild climate with a peak summer rainfall. This type of climate causes strong weathering and leaching in the soils. Calcium, magnesium, potassium, and other plant nutrients are leached from the soil by percolating rainwater. This generally results in soils with high acidity and low to medium natural fertility. Farmers rely on the application of lime and fertilizers to make up for the leaching process.

The warm, moist conditions help accelerate the weathering of minerals, resulting in the formation of more clays. Some clay is gradually translocated by the percolation of rainwater from the surface layer into the subsoil; therefore, the highest clay content in most soils is in the subsoil, generally causing slower permeability in the subsoil than in the surface layer.

Plant and Animal Life

Living organisms of all types influence soil formation. Vegetation adds organic matter to the soil through leaf fall and plant roots. The roots also create large voids in which water and air can move. Many plant nutrients are stored in organic matter. Additionally, organic matter

supplies food for bacteria, fungi, earthworms, and ants, all of which aid in improving soil structure.

Organisms also create organic compounds that influence soil formation. Many organic acids are created that break down minerals, releasing nutrients such as phosphorus and potassium. Fungi commonly dominate in pine needle litter and can create water repellency if the litter becomes dry. Water beads on the litter, as it does on a waxed metal surface, and the movement of water into the soil is hindered until the volume of water is great enough to break the surface tension.

Man influences soil formation through land use that causes erosion, compaction of the soil, and depletion of the natural soil fertility. Proper tillage, fertilization, and soil conservation, on the other hand, can change the soil into a more productive medium for plant growth. Man also mines the soil or alters the soil for construction purposes. The rate of water infiltration into the soil is decreased and runoff is increased by construction activities and by the structures that result from construction. The additional runoff can increase erosion and cause flooding in low areas.

Relief

The relief, or topography, in the City of Virginia Beach generally consists of broad, flat areas broken by a few long, narrow subdued ridges that are oriented north to south. Gently sloping to steep areas are adjacent to lakes, bays, and major drainageways.

Relief affects soil formation by controlling surface runoff and thus the rate of water infiltration into the soil. Relief commonly affects the development of a soil or the drainage. The steeper Rumford soils for example, generally have poorly developed layers; the Hyde soils in depressional areas mainly are very poorly drained, whereas the State soils on higher convex areas are well drained.

Natural differences in elevation and shape of the surface of the land account for many of the differences among soils that formed in the same kind of parent material. This is evident in the Bojac, Munden, and Nimmo soils (fig. 8). All three soils formed in loamy sediments. However, the Bojac soils are on slightly higher, convex areas and are well drained; the Munden soils are on intermediate landscape positions, are moderately well drained, and have mottles in the lower part of the subsoil; and the Nimmo soils are in low-lying landscape positions, are poorly drained, and have a gray subsoil. The differences in topography cause free water to leave the well drained soils and accumulate in the poorly drained soils.

The Acredale, Yeopim, and Chapanoke soils are another example of soils that formed from the same parent material but are different because of differences in relief and because of a resulting process called the "dry edge effect," in which soils with better drainage are along the rim of some lakes, bays, and drainageways (fig. 9). The short, steeper slopes adjacent to bodies of water help to lower the water table in soils within about 500 feet of the drainage area. The dry edge effect results in moderately well drained Yeopim soils adjacent to the drainageways, somewhat poorly drained Chapanoke soils farther from the drainageways, and poorly drained Acredale soils even farther from the drainageways.

Time

The length of time that the parent material has been in place and exposed to the active forces of climate and plant and animal life strongly influences the nature of the soil.

Older soils have developed distinct layers, or horizons, as the parent material is gradually altered by the breakdown and translocation of minerals, the accumulation of organic material, and changes in color. State soils are an example of older, more developed soils.

Young soils are essentially unaltered or slightly altered parent material. These soils generally have a thin surface layer, no subsoil, and a substratum directly beneath the surface layer. Nawney and Newhan soils are young soils. The Nawney soils formed in very recent alluvial sediments in drainageways, and the Newhan soils formed in sandy materials recently deposited by wind and water.

Major Soil Horizons

The results of the soil-forming factors can be distinguished by the different layers, or soil horizons, in a soil profile. The soil profile extends from the surface down to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons, called A, B, and C horizons. These major horizons may be further subdivided by the use of numbers and letters to indicate changes within one horizon. An example would be the B2t horizon, a B horizon that contains an accumulation of clay.

The A horizon is the surface layer. An A1 horizon is that part of the surface layer that has the largest accumulation of organic matter. The A horizon is also the layer of maximum leaching, or eluviation, of clay and iron. If considerable leaching has taken place and organic matter has not darkened the material, this horizon is called an A2 horizon.

The B horizon underlies the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the surface layer. In some soils the B horizon formed by alteration in place rather than by illuviation. The alteration can be caused by oxidation and reduction of iron or by the

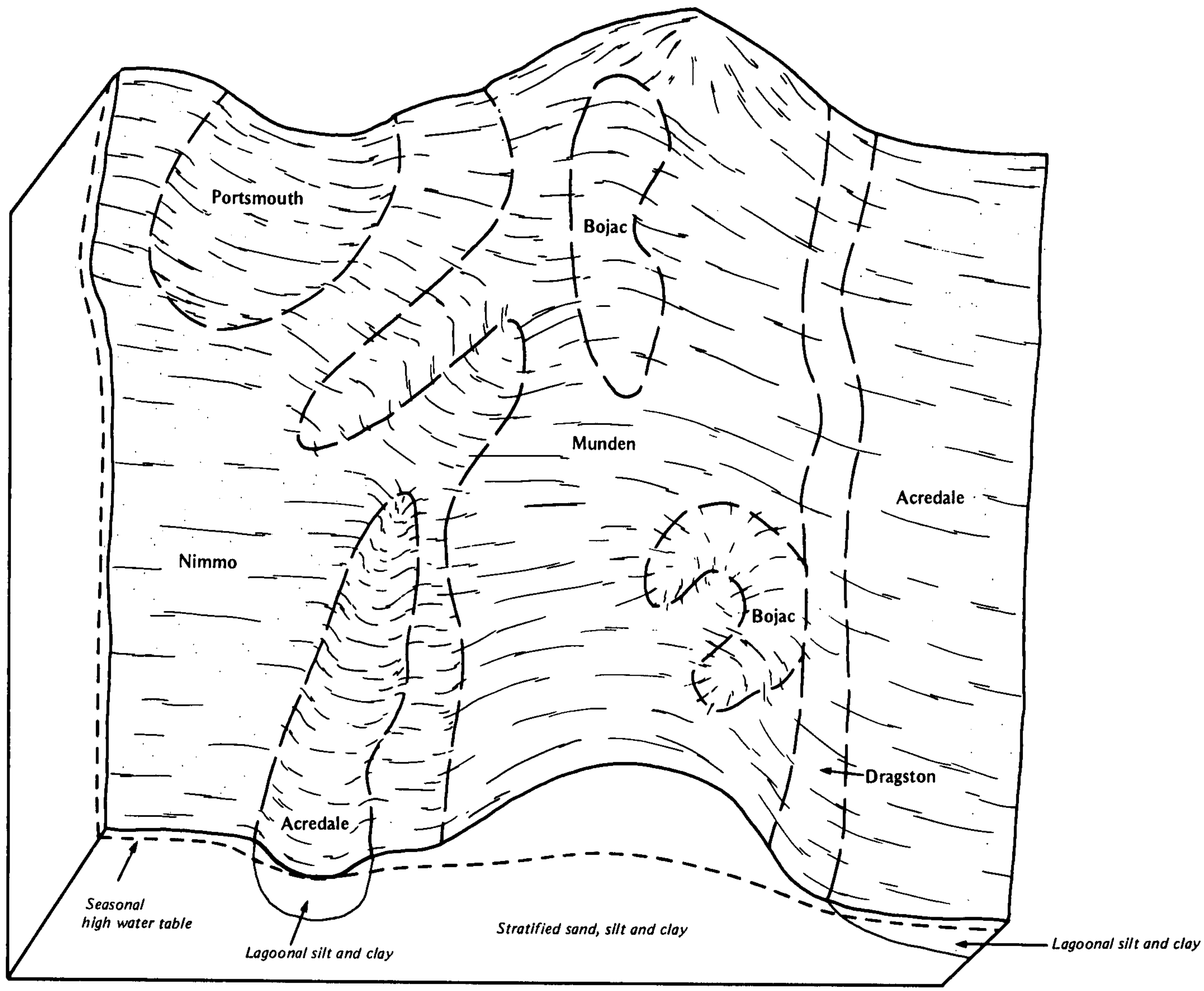


Figure 8.—Relationship between relief and soils.

weathering of clay minerals. The B horizon commonly has blocky or prismatic structure, and it generally is firmer and lighter in color than the A1 horizon but darker in color than the C horizon.

The C horizon is below the B horizon or, in some cases, below the A horizon. It consists of materials that are little altered by the soil-forming processes, but it can be modified by weathering.

Many low-lying areas adjacent to major rivers, creeks, and bays consist of soils with thick accumulations of organic materials. They are called organic soils, and they can be divided into different layers depending upon the degree of decomposition of the organic materials.

The Oi layer consists of fibric materials. These are the least decomposed of all the organic soil materials and are commonly referred to as peat.

The Oe layer consists of hemic materials, commonly referred to as mucky peat. These are intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

The Oa layer consists of sapric materials. These are the most highly decomposed of the organic materials

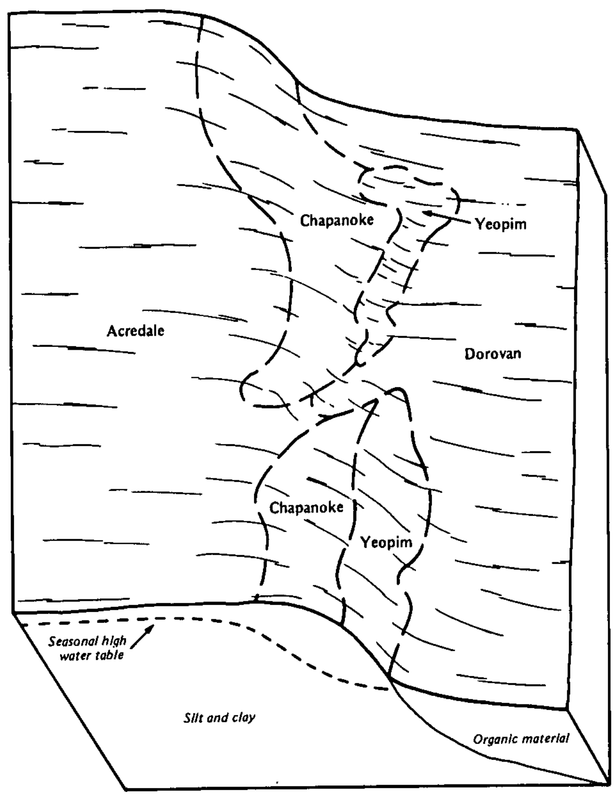


Figure 9.—The dry edge effect on the water table.

and are commonly referred to as muck. Muck is the dominant type of organic material in the organic soils of the City of Virginia Beach.

Processes of Soil Horizon Differentiation

Several processes are involved in the formation of soil horizons, especially the formation of mineral soil horizons. Among those processes are the accumulation of organic matter, the leaching of soluble salts, the reduction and transfer of iron, the formation of soil structure, and the formation and translocation of clay minerals. These processes are continually taking place and have been for thousands of years.

The accumulation and incorporation of organic matter takes place with the decomposition of plant residue. Organic soils have formed under extremely wet and anerobic conditions where plant residue has not completely decomposed. These additions darken the surface layer and help to form the A1 horizon in mineral soils. Organic matter, once lost, normally takes a long time to replace. In the City of Virginia Beach, the organic matter content of the surface layer of mineral soils averages about 1 to 2 percent.

For mineral soils to have distinct subsoil horizons, it is believed that some of the lime and soluble salts must be leached before the translocation of clay minerals. Among the factors that affect this leaching are the kinds of salts originally present, the depth to which the soil solution percolates, and the texture of the soil profile.

Well drained and moderately well drained soils in the City of Virginia Beach have a yellowish brown to strong brown subsoil. These colors are caused mainly by thin coatings of iron oxides on sand and silt grains. In some soils, however, the colors are inherited from the materials in which the soil formed. The structure of well drained and moderately well drained soils is subangular blocky, and the subsoil contains more clay than the overlying surface layer.

The reduction and transfer of iron, called gleying, is associated mainly with the wetter, more poorly drained soils. Moderately well drained to somewhat poorly

drained soils have yellowish brown and strong brown mottles, which indicate the segregation of iron. In poorly drained soils, such as Acredale and Nimmo soils, the subsoil and underlying materials are grayish, which indicates reduction and transfer of iron by removal in solution.

References

(1) American Association of State Highway and Transportation Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Coch, N.C. and R.Q. Oaks Jr. 1973. Post-Miocene stratigraphy and morphology, southeastern Virginia. Va. Div. of Min. Res. Bul. 82. 29 pp., illus.

(4) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173-188 issued May 1962.]

(5) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(6) United States Department of Agriculture. 1945. Soil survey of Princess Anne County, Virginia. Ser. 1939. No. 3.

Glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bottom land. The normal flood plain of a stream, subject to flooding.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A system that retains protective amounts of residue mulch on the surface of the soil throughout the year using no-tillage, strip stillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fast intake (in tables). The rapid movement of water into the soil.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A1 or Ap horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

A2 horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O or A horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet

and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, texture, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then

multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1949-78 at Norfolk, Virginia]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days[1]	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	48.9	32.4	40.7	75	12	138	3.47	2.51	4.56	6	3.0
February---	50.7	33.1	41.9	78	15	136	3.19	2.01	4.18	6	2.0
March------	57.5	39.4	48.5	84	24	283	3.70	2.59	4.69	7	1.0
April------	68.0	48.0	58.0	89	31	541	2.69	1.86	3.34	6	0.0
May--------	75.5	57.0	66.3	93	41	814	3.56	2.05	4.46	7	0.0
June-------	83.3	65.5	74.4	97	51	1032	3.49	2.07	4.76	6	0.0
July-------	86.8	70.0	78.4	07	59	1190	5.56	3.46	7.21	8	0.0
August-----	85.5	69.4	77.5	96	57	1158	5.56	2.62	8.16	7	0.0
September--	79.9	64.0	72.0	94	49	957	4.02	1.62	5.88	5	0.0
October----	69.9	53.2	61.6	87	34	668	3.36	1.30	4.48	5	0.0
November---	60.7	42.8	51.8	81	25	360	2.80	1.22	4.40	5	0.0
December---	51.8	34.9	43.4	74	18	180	3.20	2.69	3.92	6	1.2
Yearly:											
Average--	68.2	50.8	59.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	5	---	---	---	---	---	---
Total----	---	---	---	---	---	7,456	44.62	26.00	60.10	44	7.2

[1] A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1949-78 at Norfolk, Virginia]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	February 27	March 18	April 5
2 years in 10 later than--	February 28	March 15	April 3
5 years in 10 later than--	February 12	March 1	March 18
First freezing temperature in fall:			
1 year in 10 earlier than--	December 4	November 22	November 5
2 years in 10 earlier than--	December 8	November 24	November 12
5 years in 10 earlier than--	December 11	December 6	November 22

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1949-78 at Norfolk, Virginia]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	272	233	214
8 years in 10	283	254	226
5 years in 10	292	273	246
2 years in 10	322	290	246
1 year in 10	332	345	268

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1	Acredale silt loam	36,125	18.1
2	Acredale-Urban land complex	6,190	3.1
3	Augusta loam	3,270	1.7
4	Augusta-Urban land complex	785	0.4
5	Backbay mucky peat	9,775	4.9
6	Beaches	645	0.3
7	Bojac fine sandy loam	2,870	1.5
8	Chapanoke silt loam	1,890	1.0
9	Chapanoke-Urban land complex	335	0.2
10	Corolla fine sand	895	0.5
11	Corolla-Duckston fine sands	770	0.4
12	Dorovan mucky peat	8,830	4.5
13	Dragston fine sandy loam	4,500	2.3
14	Dragston-Urban land complex	260	0.1
15	Duckston fine sand	1,935	1.0
16E	Fripp sand, 2 to 30 percent slopes	790	0.4
17	Hyde silt loam	440	0.2
18	Lakehurst Variant sand	325	0.2
19	Munden fine sandy loam	4,275	2.2
20	Munden-Urban land complex	235	0.1
21	Nawney silt loam	4,305	2.2
22E	Newhan fine sand, 2 to 30 percent slopes	1,915	1.0
23C	Newhan-Corolla fine sands, 0 to 15 percent slopes	1,250	0.6
24	Nimmo loam	10,435	5.3
25	Nimmo-Urban land complex	425	0.2
26	Pamlico mucky peat, ponded	1,095	0.6
27	Pamlico-Lakehurst Variant complex	750	0.4
28	Pocaty peat	3,540	1.8
29	Portsmouth loam	2,130	1.1
30	Psamments, undulating	775	0.4
31	Psamments-Urban land complex	520	0.3
32	Rappahannock mucky peat, strongly saline	795	0.4
33E	Rumford fine sandy loam, 6 to 35 percent slopes	2,805	1.4
34A	State loam, 0 to 2 percent slopes	5,740	2.9
34B	State loam, 2 to 6 percent slopes	710	0.4
35	State-Urban land complex	695	0.4
36	Tetotum loam	6,060	3.1
37	Tetotum-Urban land complex	875	0.4
38	Tomotley loam	14,280	7.2
39	Tomotley-Urban land complex	2,155	1.1
40	Udorthents, loamy	4,175	2.1
41	Udorthents-Urban land complex	3,655	1.8
42	Urban land	3,710	1.9
43	Yeopim silt loam	1,330	0.7
44	Yeopim-Urban land complex	220	0.1
W	Water	38,105	19.1
	Total	197,590	100.0

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
1	Acredale silt loam (where drained)
3	Augusta loam (where drained)
7	Bojac fine sandy loam
8	Chapanoke silt loam (where drained)
13	Dragston fine sandy loam (where drained)
17	Hyde silt loam (where drained)
19	Munden fine sandy loam
24	Nimmo loam (where drained)
29	Portsmouth loam (where drained)
34A	State loam, 0 to 2 percent slopes
34B	State loam, 2 to 6 percent slopes
36	Tetotum loam
38	Tomotley loam (where drained)
43	Yeopim silt loam

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
1---------------- Acredale	IIIw	135	45	55	220	560	10.0
2---------------- Acredale-Urban land	---	---	---	---	---	---	---
3---------------- Augusta	IIIw	110	35	45	200	450	6.5
4---------------- Augusta-Urban land	---	---	---	---	---	---	---
5---------------- Backbay	VIIIw	---	---	---	---	---	---
6**. Beaches							
7---------------- Bojac	I	105	30	50	150	500	6.0
8---------------- Chapanoke	IIw	120	35	45	200	450	7.5
9---------------- Chapanoke-Urban land	---	---	---	---	---	---	---
10--------------- Corolla	VIIs	---	---	---	---	---	---
11--------------- Corolla-Duckston	VIIw	---	---	---	---	---	---
12--------------- Dorovan	VIIw	---	---	---	---	---	---
13--------------- Dragston	IIw	125	40	50	225	500	7.5
14--------------- Dragston-Urban land	---	---	---	---	---	---	---
15--------------- Duckston	VIIw	---	---	---	---	---	---
16E-------------- Fripp	VIIs	---	---	---	---	---	---
17--------------- Hyde	IIIw	135	45	55	250	560	10.0
18--------------- Lakehurst Variant	VIIs	---	---	---	---	---	---
19--------------- Munden	IIw	130	40	50	250	540	9.5

See footnote at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
20--------------- Munden-Urban land	---	---	---	---	---	---	---
21--------------- Nawney	VIIw	---	---	---	---	---	---
22E-------------- Newhan	VIIIs	---	---	---	---	---	---
23C-------------- Newhan-Corolla	VIIIs	---	---	---	---	---	---
24--------------- Nimmo	IIIw	130	40	50	250	540	9.5
25--------------- Nimmo-Urban land	---	---	---	---	---	---	---
26--------------- Pamlico	VIIw	---	---	---	---	---	---
27--------------- Pamlico-Lakehurst Variant	VIIw	---	---	---	---	---	---
28--------------- Pocaty	VIIIw	---	---	---	---	---	---
29--------------- Portsmouth	IIIw	135	45	55	250	540	10.0
30--------------- Psamments	---	---	---	---	---	---	---
31--------------- Psamments-Urban land	---	---	---	---	---	---	---
32--------------- Rappahannock	VIIIw	---	---	---	---	---	---
33E-------------- Rumford	VIe	---	---	---	---	---	---
34A-------------- State	I	120	40	55	220	510	7.5
34B-------------- State	IIe	120	40	55	220	510	7.5
35--------------- State-Urban land	---	---	---	---	---	---	---
36--------------- Tetotum	IIw	115	45	35	215	515	7.0
37--------------- Tetotum-Urban land	---	---	---	---	---	---	---
38--------------- Tomotley	IIIw	130	40	50	240	530	9.5

See footnote at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Wheat	Irish potatoes	Strawberries	Grass-clover
		Bu	Bu	Bu	Cwt	Crate	AUM*
39-------------- Tomotley-Urban land	---	---	---	---	---	---	---
40**. Udorthents							
41-------------- Udorthents-Urban land	---	---	---	---	---	---	---
42**. Urban land							
43-------------- Yeopim	IIw	110	30	45	200	450	6.5
44-------------- Yeopim-Urban land	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
1 Acredale	1w	Slight	Severe	Severe	Slight	Loblolly pine	96	Loblolly pine.
						Sweetgum	100	
						White oak	86	
						Water oak	86	
2*:								
Acredale	1w	Slight	Severe	Severe	Slight	Loblolly pine	96	Loblolly pine.
						Sweetgum	100	
						White oak	86	
						Water oak	86	
Urban land.								
3 Augusta	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine, sweetgum, American sycamore, yellow-poplar.
						Sweetgum	90	
						American sycamore	90	
						White oak	80	
						Southern red oak	80	
						Water oak	---	
4*:								
Augusta	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine, sweetgum, American sycamore, yellow-poplar.
						Sweetgum	90	
						American sycamore	90	
						White oak	80	
						Southern red oak	80	
						Water oak	---	
Urban land.								
7 Bojac	3o	Slight	Slight	Slight	Slight	Southern red oak	70	Loblolly pine, sweetgum.
						Loblolly pine	80	
						Sweetgum	80	
8 Chapanoke	2w	Slight	Moderate	Moderate	Slight	Loblolly pine	92	Loblolly pine, yellow-poplar, sweetgum, American sycamore.
						Sweetgum	---	
						Yellow-poplar	---	
						Water oak	---	
						Southern red oak	---	
9*:								
Chapanoke	2w	Slight	Moderate	Moderate	Slight	Loblolly pine	92	Loblolly pine, yellow-poplar, sweetgum, American sycamore.
						Sweetgum	---	
						Yellow-poplar	---	
						Water oak	---	
						Southern red oak	---	
Urban land.								
12 Dorovan	4w	Slight	Severe	Severe	Severe	Baldcypress	70	Baldcypress.
						Blackgum	70	
						Sweetbay	---	
13 Dragston	2w	Slight	Moderate	Slight	Slight	Southern red oak	80	Loblolly pine, sweetgum, yellow-poplar.
						Loblolly pine	86	
						Sweetgum	90	
						Yellow-poplar	90	
						White oak	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
14*: Dragston	2w	Slight	Moderate	Slight	Slight	Southern red oak	80	Loblolly pine, sweetgum, yellow-poplar.
						Loblolly pine	86	
						Sweetgum	90	
						Yellow-poplar	90	
						White oak	---	
Urban land.								
16E: Fripp	4s	Slight	Moderate	Moderate	Slight	White oak	---	Loblolly pine.
						Loblolly pine	70	
						American beech	---	
						Hickory	---	
17: Hyde	1w	Slight	Severe	Severe	Slight	White oak	---	Loblolly pine, sweetgum.
						Loblolly pine	96	
						Sweetgum	97	
						Water oak	88	
18: Lakehurst Variant	4s	Slight	Moderate	Moderate	Slight	Loblolly pine	74	Loblolly pine.
						White oak	---	
						American beech	---	
						Hickory	---	
						Sweetgum	---	
19: Munden	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine.
						Sweetgum	90	
						White oak	76	
20*: Munden	2w	Slight	Moderate	Slight	Slight	Loblolly pine	90	Loblolly pine.
						Sweetgum	90	
						White oak	76	
Urban land.								
21: Nawney	4w	Slight	Severe	Severe	Severe	Baldcypress	---	
						Water tupelo	---	
						Red maple	---	
						Sweetgum	---	
						Water oak	---	
24: Nimmo	2w	Slight	Severe	Severe	Slight	Loblolly pine	95	Loblolly pine, sweetgum.
						Sweetgum	95	
						White oak	80	
25*: Nimmo	2w	Slight	Severe	Severe	Slight	Loblolly pine	95	Loblolly pine, sweetgum.
						Sweetgum	95	
						White oak	80	
Urban land.								
26: Pamlico	4w	Slight	Severe	Severe	Severe	Baldcypress	---	Water tupelo.
						Water tupelo	---	
27*: Pamlico	4w	Slight	Severe	Severe	Severe	Baldcypress	---	Water tupelo.
						Water tupelo	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equip-ment limita-tion	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
27*:								
Lakehurst Variant-	4s	Slight	Moderate	Moderate	Slight	Loblolly pine-------	74	Loblolly pine.
						White oak-----------	---	
						American beech------	---	
						Hickory-------------	---	
						Sweetgum------------	---	
29----------------- Portsmouth	1w	Slight	Severe	Severe	Slight	Loblolly pine-------	96	Loblolly pine, sweetgum.
						Sweetgum------------	---	
						Red maple-----------	---	
						Water oak-----------	---	
						Willow oak----------	---	
						Sweetbay------------	---	
						Redbay--------------	---	
33E---------------- Rumford	3r	Slight	Moderate	Slight	Slight	Southern red oak----	66	Loblolly pine.
						Loblolly pine-------	80	
34A, 34B----------- State	1o	Slight	Slight	Slight	Slight	Southern red oak----	86	Black walnut, yellow-poplar, loblolly pine.
						Yellow-poplar-------	100	
						Virginia pine-------	86	
						Loblolly pine-------	96	
35*:								
State--------------	1o	Slight	Slight	Slight	Slight	Southern red oak----	86	Black walnut, yellow-poplar, loblolly pine.
						Yellow-poplar-------	100	
						Virginia pine-------	86	
						Loblolly pine-------	96	
Urban land.								
36----------------- Tetotum	2w	Slight	Moderate	Slight	Slight	Loblolly pine-------	88	Loblolly pine.
						Sweetgum------------	86	
						Southern red oak----	76	
						Yellow-poplar-------	90	
37*:								
Tetotum------------	2w	Slight	Moderate	Slight	Slight	Loblolly pine-------	88	Loblolly pine.
						Sweetgum------------	86	
						Southern red oak----	76	
						Yellow-poplar-------	90	
Urban land.								
38----------------- Tomotley	2w	Slight	Severe	Severe	Slight	Loblolly pine-------	94	Loblolly pine, sweetgum, American sycamore.
						Sweetgum------------	90	
39*:								
Tomotley-----------	2w	Slight	Severe	Severe	Slight	Loblolly pine-------	94	Loblolly pine, sweetgum, American sycamore.
						Sweetgum------------	90	
Urban land.								
43----------------- Yeopim	2w	Slight	Moderate	Slight	Slight	Loblolly pine-------	91	Loblolly pine.
						Sweetgum------------	---	
						Yellow-poplar-------	---	
						Southern red oak----	---	
						White oak-----------	---	
44*:								
Yeopim-------------	2w	Slight	Moderate	Slight	Slight	Loblolly pine-------	91	Loblolly pine.
						Sweetgum------------	---	
						Yellow-poplar-------	---	
						Southern red oak----	---	
						White oak-----------	---	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
44*:								
Urban land.								

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1 Acredale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
2*:					
Acredale	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
3 Augusta	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
4*:					
Augusta	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
5 Backbay	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
6*. Beaches					
7 Bojac	Slight	Slight	Slight	Slight	Slight.
8 Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
9*:					
Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
10 Corolla	Severe: wetness, too sandy.	Severe: too sandy.	Severe: wetness, too sandy.	Severe: too sandy.	Severe: droughty.
11*:					
Corolla	Severe: wetness, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
Duckston	Severe: flooding, wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness, flooding.	Severe: too sandy.	Severe: droughty, flooding.
12 Dorovan	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
13 Dragston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
14*:					
Dragston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Urban land.					
15 Duckston	Severe: flooding, wetness, too sandy.	Severe: too sandy.	Severe: too sandy, wetness, flooding.	Severe: too sandy.	Severe: droughty, flooding.
16E Fripp	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
17 Hyde	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
18 Lakehurst Variant	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
19 Munden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
20*:					
Munden	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
21 Nawney	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.
22E Newhan	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
23C*:					
Newhan	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
Corolla	Severe: wetness, too sandy.	Severe: too sandy.	Severe: wetness, too sandy.	Severe: too sandy.	Severe: droughty.
24 Nimmo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
25*:					
Nimmo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					
26 Pamlico	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
27*:					
Pamlico	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Lakehurst Variant	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
28 Pocaty	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus, flooding.	Severe: excess salt, excess sulfur, ponding.
29 Portsmouth	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30. Psamments					
31*:					
Psamments.					
Urban land.					
32 Rappahannock	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus, excess salt.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: excess salt, excess sulfur, ponding.
33E Rumford	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
34A State	Slight	Slight	Slight	Slight	Slight.
34B State	Slight	Slight	Moderate: slope.	Slight	Slight.
35*:					
State	Slight	Slight	Slight	Slight	Slight.
Urban land.					
36 Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
37*:					
Tetotum	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
38 Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
39*:					
Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
40. Udorthents					
41*: Udorthents.					
Urban land.					
42*. Urban land					
43 Yeopim	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
44*: Yeopim	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1: Acredale	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
2*: Acredale	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
3: Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
4*: Augusta	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land										
5: Backbay	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
6*. Beaches										
7: Bojac	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8: Chapanoke	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
9*: Chapanoke	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
10: Corolla	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
11*: Corolla	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
Duckston	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor.
12: Dorovan	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
13: Dragston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair.
14*: Dragston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Fair.
Urban land.										
15: Duckston	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Poor	Very poor.	Very poor.	Poor.
16E: Fripp	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
17: Hyde	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
18------------------ Lakehurst Variant	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
19------------------ Munden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
20*:										
Munden-------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
21------------------ Nawney	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
22E----------------- Newhan	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
23C*:										
Newhan-------------	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Corolla------------	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.
24------------------ Nimmo	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
25*:										
Nimmo--------------	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
26------------------ Pamlico	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
27*:										
Pamlico------------	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
Lakehurst Variant-	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Poor.
28------------------ Pocaty	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
29------------------ Portsmouth	Fair	Good	Good	Good	Good	Poor	Fair	Good	Good	Poor.
30. Psamments										
31*:										
Psamments.										
Urban land.										
33E----------------- Rumford	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
34A, 34B----------- State	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
35*:										
State	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
36 Tetotum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
37*:										
Tetotum	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										
38 Tomotley	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
39*:										
Tomotley	Fair	Fair	Fair	Good	Good	Good	Good	Fair	Good	Good.
Urban land.										
40. Udorthents										
41*:										
Udorthents.										
Urban land.										
42*. Urban land										
43 Yeopim	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
44*:										
Yeopim	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Urban land.										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1 Acredale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
2*: Acredale	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
Urban land.						
3 Augusta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
4*: Augusta	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Urban land.						
5 Backbay	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: ponding, flooding, excess humus.
6*. Beaches						
7 Bojac	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Slight.
8 Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
9*: Chapanoke	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
Urban land.						
10 Corolla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
11*: Corolla	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
Duckston	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: droughty, flooding.
12 Dorovan	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding.	Severe: ponding, flooding, excess humus.
13 Dragston	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
14*:						
Dragston----------	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Urban land.						
15----------------- Duckston	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding.	Severe: droughty, flooding.
16E---------------- Fripp	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
17----------------- Hyde	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
18----------------- Lakehurst Variant	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
19----------------- Munden	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
20*:						
Munden------------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.						
21----------------- Nawney	Severe: cutbanks cave, wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
22E---------------- Newhan	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
23C*:						
Newhan------------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
Corolla-----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: droughty.
24----------------- Nimmo	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
25*:						
Nimmo-------------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.						
26----------------- Pamlico	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding.	Severe: ponding, excess humus.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
27*:						
Pamlico----------	Severe: cutbanks cave, excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding.	Severe: ponding, excess humus.
Lakehurst Variant	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty.
28---------------- Pocaty	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding, low strength.	Severe: low strength, ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
29---------------- Portsmouth	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
30. Psamments						
31*:						
Psamments.						
Urban land.						
32---------------- Rappahannock	Severe: excess humus, ponding.	Severe: flooding, ponding, low strength.	Severe: flooding, ponding.	Severe: flooding, ponding, low strength.	Severe: ponding, flooding.	Severe: excess salt, excess sulfur, ponding.
33E--------------- Rumford	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
34A--------------- State	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: low strength.	Slight.
34B--------------- State	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Moderate: slope.	Moderate: low strength.	Slight.
35*:						
State------------	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: low strength.	Slight.
Urban land.						
36---------------- Tetotum	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
37*:						
Tetotum----------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: low strength, wetness.	Moderate: wetness.
Urban land.						
38---------------- Tomotley	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
39*:						
Tomotley---------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Urban land.						
40. Udorthents						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
41*:						
Udorthents.						
Urban land.						
42*.						
Urban land						
43----------------- Yeopim	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
44*:						
Yeopim------------	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: low strength.	Moderate: wetness.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1----- Acredale	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
2*:					
Acredale-----	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
3----- Augusta	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness.
4*:					
Augusta-----	Severe: wetness.	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: wetness.
Urban land.					
5----- Backbay	Severe: flooding, ponding, percs slowly.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding.	Severe: flooding, seepage, ponding.	Poor: ponding.
6*. Beaches					
7----- Bojac	Moderate: wetness.	Severe: seepage.	Severe: wetness, seepage.	Severe: seepage.	Fair: thin layer.
8----- Chapanoke	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
9*:					
Chapanoke-----	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
Urban land.					
10----- Corolla	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.
11*:					
Corolla-----	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Duckston-----	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12------------------ Dorovan	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: ponding, excess humus.
13------------------ Dragston	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
14*:					
Dragston-----------	Severe: wetness, poor filter.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, thin layer.
Urban land.					
15------------------ Duckston	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, wetness, too sandy.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
16E----------------- Fripp	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
17------------------ Hyde	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
18------------------ Lakehurst Variant	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
19------------------ Munden	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
20*					
Munden-------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.
Urban land.					
21------------------ Nawney	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness.	Poor: wetness.
22E----------------- Newhan	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
23C*:					
Newhan-------------	Severe: poor filter.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Corolla------------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: seepage, wetness.	Poor: seepage, too sandy.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
24------------------ Nimmo	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
25*:					
Nimmo---------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Urban land.					
26------------------ Pamlico	Severe: ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
27*:					
Pamlico-------------	Severe: ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Lakehurst Variant--	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
28------------------ Pocaty	Severe: flooding, seepage, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
29------------------ Portsmouth	Severe: wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
30. Psamments					
31*: Psamments.					
Urban land.					
32------------------ Rappahannock	Severe: flooding, ponding.	Severe: flooding, excess humus, ponding.	Severe: flooding, ponding, excess humus.	Severe: flooding, ponding.	Poor: ponding, excess humus.
33E----------------- Rumford	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
34A, 34B------------ State	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
35*:					
State---------------	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Moderate: wetness.	Fair: too clayey, thin layer.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
36------------------ Tetotum	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
37*:					
Tetotum------------	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey.
Urban land.					
38------------------ Tomotley	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
39*:					
Tomotley-----------	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
40. Udorthents					
41*:					
Udorthents.					
Urban land.					
42*. Urban land					
43------------------ Yeopim	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness.	Fair: wetness, thin layer.
44*:					
Yeopim-------------	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness.	Fair: wetness, thin layer.
Urban land.					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1---------------------- Acredale	Poor: low strength, wetness.	Probable-------------	Improbable: too sandy.	Poor: wetness.
2*:				
Acredale--------------	Poor: low strength, wetness.	Probable-------------	Improbable: too sandy.	Poor: wetness.
Urban land.				
3---------------------- Augusta	Fair: wetness.	Probable-------------	Improbable: excess fines.	Good.
4*:				
Augusta---------------	Fair: wetness.	Probable-------------	Improbable: excess fines.	Fair: small stones.
Urban land.				
5---------------------- Backbay	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
6*. Beaches				
7---------------------- Bojac	Good-----------------	Probable-------------	Improbable: too sandy.	Good.
8---------------------- Chapanoke	Poor: wetness, low strength.	Probable-------------	Improbable: excess fines.	Poor: wetness.
9*:				
Chapanoke-------------	Poor: wetness, low strength.	Probable-------------	Improbable: excess fines.	Poor: wetness.
Urban land.				
10--------------------- Corolla	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
11*:				
Corolla---------------	Fair: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
Duckston--------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy.
12--------------------- Dorovan	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, wetness.
13--------------------- Dragston	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: thin layer.
14*:				
Dragston--------------	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: thin layer.
Urban land.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
15 Duckston	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
16E Fripp	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
17 Hyde	Poor: low strength, wetness.	Probable	Improbable: excess fines.	Poor: wetness.
18 Lakehurst Variant	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
19 Munden	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
20*:				
Munden	Fair: wetness.	Probable	Improbable: too sandy.	Fair: thin layer.
Urban land.				
21 Nawney	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
22E Newhan	Fair: slope.	Probable	Improbable: too sandy.	Poor: too sandy, slope.
23C*:				
Newhan	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Corolla	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
24 Nimmo	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
25*:				
Nimmo	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
Urban land.				
26 Pamlico	Poor: low strength, wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
27*:				
Pamlico	Poor: low strength, wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
Lakehurst Variant	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
28 Pocaty	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, excess salt, wetness.
29 Portsmouth	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
30. Psamments				
31*: Psamments.				
Urban land.				
32 Rappahannock	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess humus, excess salt, wetness.
33E Rumford	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
34A, 34B State	Good	Probable	Improbable: too sandy.	Good.
35*: State	Good	Probable	Improbable: too sandy.	Good.
Urban land.				
36 Tetotum	Fair: wetness.	Probable	Improbable: excess fines.	Fair: too clayey, small stones.
37*: Tetotum	Fair: wetness.	Probable	Improbable: excess fines.	Fair: too clayey, small stones.
Urban land.				
38 Tomotley	Poor: wetness.	Probable	Improbable: excess fines.	Poor: wetness.
39*: Tomotley	Poor: wetness.	Probable	Improbable: excess fines.	Poor: wetness.
Urban land.				
40. Udorthents				
41*: Udorthents.				
Urban land.				
42*. Urban land				
43 Yeopim	Poor: low strength.	Probable	Improbable: excess fines.	Good.
44*: Yeopim	Poor: low strength.	Probable	Improbable: excess fines.	Good.
Urban land.				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Limitations for-- Aquifer-fed excavated ponds	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Grassed waterways
1----------------- Acredale	Moderate: seepage.	Severe: thin layer, wetness.	Slight---------	Percs slowly---	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
2*:						
Acredale---------	Moderate: seepage.	Severe: thin layer, wetness.	Slight---------	Percs slowly---	Wetness, percs slowly, erodes easily.	Wetness, erodes easily, percs slowly.
Urban land.						
3----------------- Augusta	Moderate: seepage.	Severe: piping, wetness.	Moderate: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness.
4*:						
Augusta----------	Moderate: seepage.	Severe: piping, wetness.	Moderate: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness.
Urban land.						
5----------------- Backbay	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Ponding, flooding.	Ponding, flooding, excess salt.	Wetness, excess salt.
6*. Beaches						
7----------------- Bojac	Severe: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Soil blowing---	Favorable.
8----------------- Chapanoke	Moderate: seepage.	Severe: wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness, erodes easily.
9*:						
Chapanoke--------	Moderate: seepage.	Severe: wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness--------	Wetness, erodes easily.
Urban land.						
10---------------- Corolla	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
11*:						
Corolla----------	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
Duckston---------	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
12---------------- Dorovan	Moderate: seepage.	Severe: excess humus, ponding.	Severe: cutbanks cave.	Ponding, flooding, subsides.	Ponding, flooding.	Wetness.
13---------------- Dragston	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
14*:						
Dragston	Severe: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Urban land.						
15 Duckston	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, droughty.
16E Fripp	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
17 Hyde	Slight	Severe: wetness.	Slight	Percs slowly	Wetness	Wetness, erodes easily.
18 Lakehurst Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
19 Munden	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Favorable.
20*:						
Munden	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, soil blowing.	Favorable.
Urban land.						
21 Nawney	Severe: seepage.	Severe: wetness.	Slight	Flooding	Flooding	Wetness.
22E Newhan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
23C*:						
Newhan	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake, slope.	Slope, droughty.
Corolla	Severe: seepage.	Severe: seepage, wetness, piping.	Severe: cutbanks cave.	Slope, cutbanks cave.	Wetness, droughty, fast intake.	Droughty.
24 Nimmo	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
25*:						
Nimmo	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty.	Wetness, droughty.
Urban land.						
26 Pamlico	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
27*:						
Pamlico----------	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: cutbanks cave.	Ponding, subsides, cutbanks cave.	Ponding, soil blowing.	Wetness.
Lakehurst Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, droughty, fast intake.	Droughty.
28---------------- Pocaty	Moderate: seepage.	Severe: excess humus, ponding.	Moderate: salty water.	Ponding, flooding, excess salt.	Ponding, flooding, excess salt.	Wetness, excess salt.
29---------------- Portsmouth	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness---------	Wetness.
30. Psamments						
31*:						
Psamments.						
Urban land.						
32---------------- Rappahannock	Slight---------	Severe: excess humus, ponding, excess salt.	Severe: salty water.	Ponding, flooding, excess salt.	Ponding, flooding, excess salt.	Wetness, excess salt.
33E--------------- Rumford	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Soil blowing, slope.	Slope.
34A--------------- State	Moderate: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Favorable------	Favorable.
34B--------------- State	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Slope-----------	Favorable.
35*:						
State-------------	Moderate: seepage.	Moderate: thin layer, piping.	Severe: cutbanks cave.	Deep to water	Favorable------	Favorable.
Urban land.						
36---------------- Tetotum	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness---------	Favorable.
37*:						
Tetotum-----------	Moderate: seepage.	Severe: wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness---------	Favorable.
Urban land.						
38---------------- Tomotley	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness---------	Wetness.
39*:						
Tomotley----------	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness---------	Wetness.
Urban land.						

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Irrigation	Grassed waterways
40. Udorthents						
41*: Udorthents.						
Urban land.						
42*. Urban land						
43 Yeopim	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, erodes easily.	Erodes easily.
44*: Yeopim	Moderate: seepage.	Severe: piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, erodes easily.	Erodes easily.
Urban land.						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
1----------------- Acredale	0-7	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	7-15	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	15-43	Silt loam, silty clay loam.	CL	A-4, A-5, A-6, A-7	0	100	100	90-100	70-95	20-45	7-25
	43-66	Sandy loam, loamy sand, sand.	SM, SC, SM-SC, SW-SM	A-2, A-3, A-4	0	100	100	55-75	5-40	<30	NP-15
2*: Acredale---------	0-7	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	7-15	Silt loam, loam	CL, ML, CL-ML	A-4, A-6	0	100	100	80-100	50-90	<30	NP-15
	15-43	Silt loam, silty clay loam.	CL	A-4, A-5, A-6, A-7	0	100	100	90-100	70-95	20-45	7-25
	43-66	Sandy loam, loamy sand, sand.	SM, SC, SM-SC, SW-SM	A-2, A-3, A-4	0	100	100	55-75	5-40	<30	NP-15
Urban land.											
3----------------- Augusta	0-8	Loam-------------	ML, CL-ML	A-4	0	90-100	75-100	75-100	51-75	<35	NP-10
	8-45	Sandy clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	75-100	75-95	51-80	20-45	5-25
	45-63	Sandy loam, loamy sand, sand.	SM, SP-SM, ML, SM-SC	A-2, A-4, A-1	0	75-100	55-100	30-90	10-70	<25	NP-5
4*: Augusta----------	0-8	Loam-------------	ML, CL-ML	A-4	0	90-100	75-100	75-100	51-75	<35	NP-10
	8-45	Sandy clay loam, clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	75-100	75-95	51-80	20-45	5-25
	45-63	Sandy loam, loamy sand, sand.	SM, SP-SM, ML, SM-SC	A-2, A-4, A-1	0	75-100	55-100	30-90	10-70	<25	NP-5
Urban land.											
5----------------- Backbay	0-11	Mucky-peat-------	Pt	A-8	---	---	---	---	---	---	---
	11-22	Sandy loam, loam, silt loam.	SM, CL, SM-SC, CL-ML	A-4, A-6	0	100	100	60-100	35-90	<22	NP-12
	22-60	Stratified sandy loam to silty clay loam.	SM, ML, CL, SC	A-4, A-6	0	100	100	60-100	35-95	<40	NP-20
6*. Beaches											
7----------------- Bojac	0-8	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-2, A-4	0	95-100	95-100	55-100	30-60	<25	NP-7
	8-38	Fine sandy loam, loam, sandy loam.	ML, SM	A-2, A-4	0	95-100	95-100	55-100	20-60	<35	NP-10
	38-62	Stratified loamy fine sand to sand.	SM, SP, SW-SM	A-1, A-2, A-3	0	80-100	75-100	12-100	2-35	<20	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8---------------- Chapanoke	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-90	<30	NP-7
	7-53	Silty clay loam, silt loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	85-100	60-95	22-49	8-30
	53-72	Fine sandy loam, loamy fine sand.	SM, SM-SC, ML	A-2, A-4	0	100	100	50-85	15-55	<30	NP-7
9*:											
Chapanoke--------	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	85-100	60-90	<30	NP-7
	7-53	Silty clay loam, silt loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	85-100	60-95	22-49	8-30
	53-72	Fine sandy loam, loamy fine sand.	SM, SM-SC, ML	A-2, A-4	0	100	100	50-85	15-55	<30	NP-7
Urban land.											
10--------------- Corolla	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
11*:											
Corolla----------	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
Duckston---------	0-72	Fine sand, sand	SP-SM, SP	A-3	0	100	95-100	60-75	3-10	---	NP
12--------------- Dorovan	0-4	Mucky peat-------	Pt	---	0	---	---	---	---	---	---
	4-78	Muck-------------	Pt	---	0	---	---	---	---	---	---
	78-80	Silt to clay.	CL, ML	A-6, A-7,	0	100	100	90-100	85-95	20-45	8-30
13--------------- Dragston	0-9	Fine sandy loam	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<20	NP-8
	9-38	Fine sandy loam, sandy loam, loam.	SM-SC CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<25	NP-10
	38-60	Sand, loamy sand, sandy loam.	SM, SP-SM, SM-SC	A-1, A-2, A-3	0	95-100	85-100	35-70	5-30	<18	NP-7
14*:											
Dragston---------	0-9	Fine sandy loam	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<20	NP-8
	9-38	Fine sandy loam, sandy loam, loam.	SM, SC, CL, ML	A-2, A-4	0	100	95-100	60-85	30-60	<25	NP-10
	38-60	Sand, loamy sand, sandy loam.	SM, SP-SM, SM-SC	A-1, A-2, A-3	0	95-100	85-100	35-70	5-30	<18	NP-7
Urban land.											
15--------------- Duckston	0-72	Fine sand, sand	SP-SM, SP	A-3	0	100	95-100	60-75	3-10	---	NP
16E-------------- Fripp	0-5	Sand-------------	SP, SP-SM	A-3	0	100	98-100	85-99	0-5	---	NP
	5-60	Fine sand, sand	SP, SP-SM	A-3	0	100	98-100	85-99	0-5	---	NP
17--------------- Hyde	0-16	Silt loam--------	CL-ML, ML	A-4	0	100	98-100	85-100	60-90	<25	NP-7
	16-58	Silt loam, loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	98-100	90-100	75-95	22-42	7-20
	58-72	Variable---------	---	---	---	---	---	---	---	---	---
18--------------- Lakehurst Variant	0-4	Sand-------------	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
	4-72	Sand, fine sand	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
19---------------- Munden	0-8	Fine sandy loam	SM, SC, SM-SC	A-4	0	100	98-100	60-95	35-75	<22	NP-10
	8-32	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	98-100	60-95	30-75	<30	NP-15
	32-62	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	98-100	50-90	5-35	<18	NP-7
20*:											
Munden-----------	0-8	Fine sandy loam	SM, SC, SM-SC	A-4	0	100	98-100	60-95	35-75	<22	NP-10
	8-32	Sandy loam, loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	100	98-100	60-95	30-75	<30	NP-15
	32-62	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	98-100	50-90	5-35	<18	NP-7
Urban land.											
21---------------- Nawney	0-5	Silt loam---------	CL	A-6, A-7	0	100	98-100	85-100	55-95	30-45	10-24
	5-43	Stratified sandy loam to silty clay loam.	SM, SC, ML, CL	A-4, A-6, A-7	0	100	98-100	60-100	35-95	14-46	3-25
	43-60	Variable----------	---	---	---	---	---	---	---	---	---
22E--------------- Newhan	0-72	Fine sand, sand	SP	A-3	0	95-100	95-100	60-75	0-5	---	NP
23C*:											
Newhan-----------	0-72	Fine sand, sand	SP	A-3	0	95-100	95-100	60-75	0-5	---	NP
Corolla----------	0-72	Fine sand, sand	SW, SP-SM, SP	A-2, A-3	0	100	98-100	60-75	3-12	---	NP
24---------------- Nimmo	0-7	Loam--------------	SM, SC, SM-SC, ML	A-4	0	100	95-100	60-85	36-60	<22	NP-10
	7-33	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0	100	95-100	60-95	30-75	<30	NP-15
	33-60	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	95-100	50-80	5-35	<18	NP-7
25*:											
Nimmo------------	0-7	Loam--------------	SM, SC, SM-SC, ML	A-4	0	100	95-100	60-85	36-60	<22	NP-10
	7-33	Loam, fine sandy loam, sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0	100	95-100	60-95	30-75	<30	NP-15
	33-60	Loamy sand, fine sand, sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	95-100	50-80	5-35	<18	NP-7
Urban land.											
26---------------- Pamlico	0-30	Mucky peat--------	Pt	---	0	---	---	---	---	---	---
	30-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-20	---	NP
27*:											
Pamlico----------	0-30	Mucky peat--------	Pt	---	0	---	---	---	---	---	---
	30-60	Sand, loamy sand	SM, SP-SM	A-2, A-3	0	100	100	70-95	5-20	---	NP
Lakehurst Variant---------	0-4	Sand--------------	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
	4-72	Sand, fine sand	SP, SP-SM	A-3	0	100	100	50-80	0-15	---	NP
28---------------- Pocaty	0-12	Peat--------------	Pt	A-8	---	---	---	---	---	---	---
	12-20	Mucky-peat, muck	Pt	A-8	---	---	---	---	---	---	---
	20-60	Muck--------------	Pt	A-8	---	---	---	---	---	---	---
	60-80	Variable----------	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
29---------------- Portsmouth	0-13	Loam-------------	SM, SM-SC, ML	A-2, A-4	0	98-100	98-100	65-95	30-65	<30	NP-7
	13-36	Loam, sandy loam, silt loam.	SC, CL-ML, CL	A-4, A-6	0	98-100	98-100	75-95	36-70	18-40	7-18
	36-60	Stratified sand to loamy sand.	SP-SM, SP, SM	A-1, A-2, A-3	0	98-100	98-100	45-65	3-25	---	NP
30. Psamments											
31*: Psamments.											
Urban land.											
32---------------- Rappahannock	0-11	Mucky peat-------	Pt	A-8	0	---	---	---	---	---	---
	11-37	Mucky peat, muck	Pt	A-8	0	---	---	---	---	---	---
	37-51	Variable---------	---	---	---	---	---	---	---	---	---
33E--------------- Rumford	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	90-100	85-100	55-85	30-50	<25	NP-6
	10-41	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	80-100	75-100	55-85	30-50	<34	NP-12
	41-72	Stratified sandy loam to gravelly sand.	SM, SP, GP, GM	A-1, A-2, A-3, A-4	0	50-100	35-100	20-85	2-40	<25	NP-6
34A, 34B--------- State	0-11	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	95-100	95-100	65-95	45-85	<28	NP-15
	11-56	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	75-100	35-80	24-40	8-22
	56-64	Stratified sand to fine sandy loam.	SM, SM-SC, SP-SM	A-1, A-2, A-3, A-4	0	85-100	75-100	40-90	5-50	<25	NP-7
35*: State-----------	0-11	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	95-100	95-100	65-95	45-85	<28	NP-15
	11-56	Loam, clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	95-100	95-100	75-100	35-80	24-40	8-22
	56-64	Stratified sand to fine sandy loam.	SM, SM-SC, SP-SM	A-1, A-2, A-3, A-4	0	85-100	75-100	40-90	5-50	<25	NP-7
Urban land.											
36---------------- Tetotum	0-10	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	85-100	80-100	65-95	45-85	<30	NP-15
	10-58	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0-2	85-100	80-100	60-95	35-85	30-45	10-20
	58-70	Stratified sand sandy to clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
37*: Tetotum---------	0-10	Loam-------------	SM, SC, ML, CL	A-4, A-6	0	85-100	80-100	65-95	45-85	<30	NP-15
	10-58	Sandy clay loam, clay loam, loam.	SC, CL	A-6, A-7	0-2	85-100	80-100	60-95	35-85	30-45	10-20
	58-70	Stratified sand to sandy clay loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-2	80-100	75-100	50-95	15-75	<30	NP-15
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
38---------------- Tomotley	0-7	Loam--------------	ML	A-4	0	98-100	95-100	75-100	51-98	<40	NP-10
	7-45	Loam, silt loam, clay loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	98-100	95-100	75-98	30-70	20-40	6-18
	45-66	Variable----------	---	---	---	---	---	---	---	---	---
39*: Tomotley---------	0-7	Loam--------------	ML	A-4	0	98-100	95-100	75-100	51-98	<40	NP-10
	7-45	Loam, silt loam, loam, clay loam.	SM-SC, SC, CL-ML, CL	A-2, A-4, A-6	0	98-100	95-100	75-98	30-70	20-40	6-18
	45-66	Variable----------	---	---	---	---	---	---	---	---	---
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											
43---------------- Yeopim	0-8	Silt loam---------	ML, CL-ML	A-4	0	100	100	85-100	55-80	<30	NP-7
	8-79	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	22-49	8-30
	79-84	Stratified sand to loam.	SM, ML, SM-SC, SP-SM	A-2, A-3, A-4	0	98-100	98-100	50-95	5-80	<20	NP-7
44*: Yeopim-----------	0-8	Silt loam---------	ML, CL-ML	A-4	0	100	100	85-100	55-80	<30	NP-7
	8-79	Silty clay loam, clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	90-100	70-90	22-49	8-30
	79-84	Stratified sand to loam.	SM, ML, SM-SC, SP-SM	A-2, A-3, A-4	0	98-100	98-100	50-95	5-80	<20	NP-7
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
1---------------- Acredale	0-7	8-15	1.20-1.35	0.6-2.0	0.17-0.20	3.6-5.5	<2	Low----------	0.37	3	2-4
	7-15	12-20	1.20-1.35	0.6-2.0	0.17-0.20	4.5-7.3	<2	Low----------	0.37		
	15-43	18-34	1.25-1.40	0.06-0.2	0.13-0.20	4.5-7.3	<2	Moderate-----	0.37		
	43-66	5-18	1.30-1.50	2.0-20	0.04-0.12	4.5-7.3	<2	Low----------	0.24		
2*:											
Acredale---------	0-7	8-15	1.20-1.35	0.6-2.0	0.17-0.20	3.6-5.5	<2	Low----------	0.37	3	2-4
	7-15	12-20	1.20-1.35	0.6-2.0	0.17-0.20	4.5-7.3	<2	Low----------	0.37		
	15-43	18-34	1.25-1.40	0.06-0.2	0.13-0.20	4.5-7.3	<2	Moderate-----	0.37		
	43-66	5-18	1.30-1.50	2.0-20	0.04-0.12	4.5-7.3	<2	Low----------	0.24		
Urban land.											
3---------------- Augusta	0-8	10-25	1.25-1.50	0.6-2.0	0.15-0.22	4.5-6.0	<2	Low----------	0.24	4	.5-2
	8-45	20-35	1.30-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low----------	0.24		
	45-63	3-18	1.30-1.50	2.0-6.0	0.06-0.12	4.5-6.0	<2	Low----------	0.24		
4*:											
Augusta----------	0-8	10-25	1.25-1.50	0.6-2.0	0.15-0.22	4.5-6.0	<2	Low----------	0.24	4	.5-2
	8-45	20-35	1.30-1.50	0.6-2.0	0.12-0.18	4.5-6.0	<2	Low----------	0.24		
	45-63	3-18	1.30-1.50	2.0-6.0	0.06-0.12	4.5-6.0	<2	Low----------	0.24		
Urban land.											
5---------------- Backbay	0-11	---	0.10-0.20	2.0-6.0	0.15-0.22	4.5-6.0	2-8	Low----------	----	---	20-80
	11-22	10-27	1.15-1.35	0.2-2.0	0.16-0.20	5.1-7.3	2-4	Low----------	0.20		
	22-60	8-34	1.20-1.40	0.2-2.0	0.14-0.20	5.1-7.3	<2	Moderate-----	0.20		
6*. Beaches											
7---------------- Bojac	0-8	3-8	1.20-1.50	2.0-6.0	0.10-0.18	4.5-6.0	<2	Low----------	0.28	3	.5-2
	8-38	11-16	1.35-1.55	2.0-6.0	0.10-0.17	4.5-6.0	<2	Low----------	0.28		
	38-62	1-8	1.30-1.50	>6.0	0.02-0.07	4.5-6.0	<2	Low----------	0.28		
8---------------- Chapanoke	0-7	7-27	1.30-1.50	2.0-6.0	0.15-0.24	3.6-6.5	<2	Low----------	0.43	5	.5-2
	7-53	18-35	1.30-1.50	0.2-0.6	0.15-0.22	3.6-6.5	<2	Low----------	0.43		
	53-72	7-28	1.30-1.50	0.6-2.0	0.15-0.24	3.6-6.5	<2	Low----------	0.37		
9*:											
Chapanoke--------	0-7	7-27	1.30-1.50	2.0-6.0	0.15-0.24	3.6-6.5	<2	Low----------	0.43	5	.5-2
	7-53	18-35	1.30-1.50	0.2-0.6	0.15-0.22	3.6-6.5	<2	Low----------	0.43		
	53-72	7-28	1.30-1.50	0.6-2.0	0.15-0.24	3.6-6.5	<2	Low----------	0.37		
Urban land.											
10--------------- Corolla	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low----------	0.10	5	<.5
11*:											
Corolla----------	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low----------	0.10	5	<.5
Duckston---------	0-72	0-4	1.60-1.70	>20	0.02-0.05	3.6-7.3	<2	Low----------	0.10	5	.5-1
12--------------- Dorovan	0-4	---	0.25-0.40	0.6-2.0	0.25-0.50	3.6-4.4	<2	-------------	----	---	20-80
	4-78	---	0.35-0.55	0.6-2.0	0.25-0.50	3.6-4.4	<2	-------------	----		
	78-80	10-50	1.40-1.65	0.06-2.0	0.12-0.19	3.6-6.5	<2	Moderate-----	----		
13--------------- Dragston	0-9	4-12	1.20-1.50	2.0-6.0	0.08-0.15	4.5-5.5	<2	Low----------	0.24	4	.5-1
	9-38	10-18	1.25-1.45	2.0-6.0	0.08-0.16	4.5-5.5	<2	Low----------	0.17		
	38-60	2-12	1.35-1.55	6.0-20.0	0.04-0.10	4.5-5.5	<2	Low----------	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Organic matter
									K	T	
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
14*:											
Dragston----------	0-9	4-12	1.20-1.50	2.0-6.0	0.08-0.15	4.5-5.5	<2	Low----------	0.24	4	.5-1
	9-38	10-18	1.25-1.45	2.0-6.0	0.08-0.16	4.5-5.5	<2	Low----------	0.17		
	38-60	2-12	1.35-1.55	6.0-20	0.04-0.10	4.5-5.5	<2	Low----------	0.17		
Urban land.											
15---------------- Duckston	0-72	0-4	1.60-1.70	>20	0.02-0.05	3.6-7.3	<2	Low----------	0.10	5	.5-1
16E--------------- Fripp	0-5	<5	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	5-60	<5	1.30-1.70	>20	0.04-0.03	3.6-5.0	<2	Low----------	0.10		
17---------------- Hyde	0-16	5-18	1.30-1.50	0.6-2.0	0.13-0.20	3.6-5.5	<2	Low----------	0.17	5	4-15
	16-58	18-35	1.30-1.40	.06-0.2	0.15-0.20	3.6-5.5	<2	Low----------	0.43		
	58-72	---	---	---	---	---	---	-------------	----		
18---------------- Lakehurst Variant	0-4	0-2	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	4-72	0-4	1.35-1.65	>20	0.02-0.06	3.6-5.0	<2	Low----------	0.10		
19---------------- Munden	0-8	4-16	1.20-1.35	2.0-6.0	0.06-0.15	4.5-6.0	<2	Low----------	0.20	4	1-2
	8-32	8-18	1.20-1.35	2.0-6.0	0.08-0.17	4.5-6.0	<2	Low----------	0.17		
	32-62	2-12	1.35-1.55	6.0-20	0.04-0.08	4.5-6.0	<2	Low----------	0.17		
20*:											
Munden-----------	0-8	4-16	1.20-1.35	2.0-6.0	0.06-0.15	4.5-6.0	<2	Low----------	0.20	4	1-2
	8-32	8-18	1.20-1.35	2.0-6.0	0.08-0.17	4.5-6.0	<2	Low----------	0.17		
	32-62	2-12	1.35-1.55	---	0.04-0.08	4.5-6.0	<2	Low----------	0.17		
Urban land.											
21---------------- Nawney	0-5	10-27	1.20-1.35	0.6-2.0	0.14-0.22	3.6-5.5	<2	Low----------	0.32	5	2-3
	5-43	18-35	1.25-1.50	0.6-2.0	0.10-0.22	3.6-5.5	<2	Moderate-----	0.28		
	43-60	---	---	---	---	3.6-6.5	---	-------------	----		
22E--------------- Newhan	0-72	0-3	1.60-1.70	>20	<0.05	3.6-7.3	<2	Low----------	0.10	5	<.5
23C*:											
Newhan-----------	0-72	0-3	1.60-1.70	>20	<0.05	3.6-7.3	<2	Low----------	0.10	5	<.5
Corolla----------	0-72	0-3	1.60-1.70	>20	0.01-0.03	3.6-7.3	<2	Low----------	0.10	5	<.5
24---------------- Nimmo	0-7	4-14	1.20-1.35	2.0-6.0	0.06-0.15	3.6-5.5	<2	Low----------	0.17	4	1-2
	7-33	8-18	1.20-1.35	0.6-2.0	0.08-0.17	3.6-5.5	<2	Low----------	0.17		
	33-60	1-8	1.35-1.55	6.0-20	0.04-0.08	3.6-5.5	<2	Low----------	0.17		
25*:											
Nimmo------------	0-7	4-14	1.20-1.35	2.0-6.0	0.06-0.15	3.6-5.5	<2	Low----------	0.17	4	1-2
	7-33	8-18	1.20-1.35	0.6-2.0	0.08-0.17	3.6-5.5	<2	Low----------	0.17		
	33-60	1-8	1.35-1.55	6.0-20	0.04-0.08	3.6-5.5	<2	Low----------	0.17		
Urban land.											
26---------------- Pamlico	0-30	---	0.20-0.65	0.6-6.0	0.24-0.40	3.6-5.5	<2	Low----------	----	---	20-80
	30-60	5-10	1.60-1.75	6.0-20	0.02-0.10	3.6-5.5	<2	Low----------	0.10		
27*:											
Pamlico----------	0-30	---	0.20-0.65	0.6-6.0	0.24-0.40	3.6-5.5	<2	Low----------	----	---	20-80
	30-60	5-10	1.60-1.75	6.0-20	0.02-0.10	3.6-5.5	<2	Low----------	0.10		
Lakehurst Variant---------	0-4	0-2	1.30-1.50	>20	0.04-0.08	3.6-5.0	<2	Low----------	0.10	5	.5-2
	4-72	0-4	1.35-1.65	>20	0.02-0.06	3.6-5.0	<2	Low----------	0.10		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea-bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH	Mmhos/cm				Pct
28---------------- Pocaty	0-12	---	0.05-0.20	2.0-6.0	0.15-0.20	4.5-7.3	2-16	Low----------	----	---	30-90
	12-20	---	0.10-0.35	0.6-2.0	0.20-0.25	4.5-7.3	2-16	Low----------	----		
	20-60	---	0.20-0.55	0.6-2.0	0.20-0.30	4.5-7.3	2-16	Low----------	----		
	60-80	5-50	1.30-1.60	0.06-0.2	0.06-0.18	4.5-7.3	<2	Low----------	0.02		
29---------------- Portsmouth	0-13	5-25	1.30-1.40	0.6-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	4-8
	13-36	20-35	1.45-1.55	0.6-2.0	0.14-0.20	3.6-5.5	<2	Low----------	0.28		
	36-60	2-10	1.40-1.65	2.0-20	0.02-0.05	3.6-5.5	<2	Low----------	0.17		
30. Psamments											
31*: Psamments.											
Urban land.											
32---------------- Rappahannock	0-11	---	0.10-0.60	0.6-2.0	0.22-0.26	6.6-7.8	>16	Low----------	----	---	20-65
	11-37	---	0.10-1.00	0.6-2.0	0.22-0.26	6.6-7.8	>16	Low----------	----		
	37-51	---	---	---	---	---	---	-------------	----		
33E--------------- Rumford	0-10	6-15	1.25-1.45	2.0-6.0	0.08-0.14	3.6-5.5	<2	Low----------	0.24	4	.5-2
	10-41	8-18	1.25-1.45	2.0-6.0	0.10-0.15	3.6-5.5	<2	Low----------	0.17		
	41-72	2-18	1.25-1.50	>2.0	0.04-0.10	3.6-5.5	<2	Low----------	0.17		
34A, 34B---------- State	0-11	10-18	1.20-1.35	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low----------	0.38	5	<2
	11-56	18-34	1.35-1.50	0.6-2.0	0.14-0.19	4.5-5.5	<2	Low----------	0.28		
	56-64	2-15	1.35-1.50	2.0-20	0.02-0.10	4.5-6.0	<2	Low----------	0.17		
35*: State------------	0-11	10-18	1.20-1.35	0.6-2.0	0.12-0.17	4.5-5.5	<2	Low----------	0.38	5	<2
	11-56	18-34	1.35-1.50	0.6-2.0	0.14-0.19	4.5-5.5	<2	Low----------	0.28		
	56-64	2-15	1.35-1.50	2.0-20	0.02-0.10	4.5-6.0	<2	Low----------	0.17		
Urban land.											
36---------------- Tetotum	0-10	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.37	4	.5-2
	10-58	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	58-70	5-30	1.25-1.45	2.0-20	0.06-0.15	3.6-5.5	<2	Low----------	0.32		
37*: Tetotum----------	0-10	10-22	1.20-1.35	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.37	4	.5-2
	10-58	18-35	1.25-1.45	0.6-2.0	0.14-0.19	3.6-5.5	<2	Low----------	0.32		
	58-70	5-30	1.25-1.45	2.0-20	0.06-0.15	3.6-5.5	<2	Low----------	0.32		
Urban land.											
38---------------- Tomotley	0-7	5-27	1.20-1.40	2.0-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	2-4
	7-45	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low----------	0.20		
	45-66	5-30	1.30-1.50	2.0-6.0	0.05-0.12	3.6-5.5	<2	Low----------	0.20		
39*: Tomotley---------	0-7	5-27	1.20-1.40	2.0-6.0	0.12-0.18	3.6-5.5	<2	Low----------	0.24	5	2-4
	7-45	18-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-5.5	<2	Low----------	0.20		
	45-66	5-30	1.30-1.50	2.0-6.0	0.05-0.12	3.6-5.5	<2	Low----------	0.20		
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH	Mmhos/cm				Pct
43---------------- Yeopim	0-8	4-15	1.20-1.40	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.37	4	.5-2
	8-79	20-35	1.40-1.60	0.2-0.6	0.15-0.20	3.6-5.5	<2	Low----------	0.37		
	79-84	5-25	1.40-1.60	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.17		
44*:											
Yeopim-----------	0-8	4-15	1.20-1.40	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.37	4	.5-2
	8-79	20-35	1.40-1.60	0.2-0.6	0.15-0.20	3.6-5.5	<2	Low----------	0.37		
	79-84	5-25	1.40-1.60	2.0-6.0	0.15-0.20	3.6-5.5	<2	Low----------	0.17		
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
1----------------- Acredale	D	None--------	---	---	0-1.0	Apparent	Dec-Apr	---	---	High-----	High.
2*:											
Acredale---------	D	None--------	---	---	0-1.0	Apparent	Dec-Apr	---	---	High-----	High.
Urban land.											
3----------------- Augusta	C	None--------	---	---	1.0-1.5	Apparent	Jan-May	---	---	High-----	Moderate.
4*:											
Augusta----------	C	None--------	---	---	1.0-1.5	Apparent	Jan-May	---	---	High-----	Moderate.
Urban land.											
5----------------- Backbay	D	Frequent----	Very long	Jan-Dec	+1-0	Apparent	Jan-Dec	---	---	High-----	High.
6*. Beaches											
7----------------- Bojac	B	None--------	---	---	4.0-6.0	Apparent	Nov-Apr	---	---	Low------	High.
8----------------- Chapanoke	C	None--------	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	High-----	High.
9*:											
Chapanoke--------	C	None--------	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	High-----	High.
Urban land.											
10---------------- Corolla	D	None--------	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low------	Low.
11*:											
Corolla----------	D	None--------	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low------	Low.
Duckston---------	A	Frequent----	Brief-----	Jan-Dec	0-1.0	Apparent	Jan-Dec	---	---	Low------	Low.
12---------------- Dorovan	D	Frequent----	Very long	Jan-Dec	+1-0.5	Apparent	Jan-Dec	4-12	51-78	High-----	High.
13---------------- Dragston	C	None--------	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	Low------	High.
14*:											
Dragston---------	C	None--------	---	---	1.0-1.5	Apparent	Nov-Apr	---	---	Low------	High.
Urban land.											
15---------------- Duckston	A	Frequent----	Brief-----	Jan-Dec	0-1.0	Apparent	Jan-Dec	---	---	Low------	Low.
16E--------------- Fripp	A	None--------	---	---	>6.0	---	---	---	---	Low------	Low.
17---------------- Hyde	D	None--------	---	---	0-0.5	Apparent	Dec-Apr	---	---	High-----	High.
18---------------- Lakehurst Variant	A	None--------	---	---	1.5-3.0	Apparent	Nov-May	---	---	Low------	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
19----------------- Munden	B	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	Low--------	High.
20*: Munden------------	B	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	Low--------	High.
Urban land.											
21----------------- Nawney	D	Frequent----	Very long	Jan-Dec	0-0.5	Apparent	Jan-Dec	---	---	High-------	High.
22E---------------- Newhan	A	None---------	---	---	>6.0	---	---	---	---	High-------	Low.
23C*: Newhan------------	A	None---------	---	---	>6.0	---	---	---	---	High-------	Low.
Corolla-----------	D	None---------	---	---	1.0-3.0	Apparent	Nov-May	---	---	Low--------	Low.
24----------------- Nimmo	D	None---------	---	---	0-1.0	Apparent	Dec-Apr	---	---	Low--------	High.
25*: Nimmo-------------	D	None---------	---	---	0-1.0	Apparent	Dec-Apr	---	---	Low--------	High.
Urban land.											
26----------------- Pamlico	D	Rare---------	---	---	+2-0	Apparent	Dec-May	4-20	10-36	High-------	High.
27*: Pamlico-----------	D	Rare---------	---	---	+2-0	Apparent	Dec-May	4-20	10-36	High-------	High.
Lakehurst Variant	A	None---------	---	---	1.5-3.0	Apparent	Nov-May	---	---	Low--------	High.
28----------------- Pocaty	D	Frequent----	Very long	Jan-Dec	+1-1.0	Apparent	Jan-Dec	---	---	High-------	High.
29----------------- Portsmouth	D	None---------	---	---	0-0.5	Apparent	Dec-Apr	---	---	High-------	High.
30. Psamments											
31*: Psamments.											
Urban land.											
32----------------- Rappahannock	D	Frequent----	Very brief	Jan-Dec	+2-0.5	Apparent	Jan-Dec	---	---	High-------	High.
33E---------------- Rumford	B	None---------	---	---	>6.0	---	---	---	---	Low--------	High.
34A, 34B----------- State	B	None---------	---	---	4.0-6.0	Apparent	Dec-Jun	---	---	Moderate	High.
35*: State-------------	B	None---------	---	---	4.0-6.0	Apparent	Dec-Jun	---	---	Moderate	High.
Urban land.											
36----------------- Tetotum	C	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	High-------	High.
37*: Tetotum-----------	C	None---------	---	---	1.5-2.5	Apparent	Dec-Apr	---	---	High-------	High.
Urban land.											

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Subsidence		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Initial	Total	Uncoated steel	Concrete
					Ft			In	In		
38 Tomotley	D	None	---	---	0-1.0	Apparent	Dec-Mar	---	---	High	High.
39*: Tomotley	D	None	---	---	0-1.0	Apparent	Dec-Mar	---	---	High	High.
Urban land.											
40. Udorthents											
41*: Udorthents.											
Urban land.											
42*. Urban land											
43 Yeopim	B	None	---	---	1.5-2.5	Apparent	Nov-Mar	---	---	Moderate	High.
44*: Yeopim	B	None	---	---	1.5-2.5	Apparent	Nov-Mar	---	---	Moderate	High.
Urban land.											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Acredale	Fine-silty, mixed, thermic Typic Ochraqualfs
Augusta	Fine-loamy, mixed, thermic Aeric Ochraquults
Backbay	Fine-loamy, mixed, nonacid, thermic Histic Humaquepts
Bojac	Coarse-loamy, mixed, thermic Typic Hapludults
Chapanoke	Fine-silty, mixed thermic Aeric Ochraquults
Corolla	Thermic, uncoated Aquic Quartzipsamments
*Dorovan	Dysic, thermic Typic Medisaprists
Dragston	Coarse-loamy, mixed, thermic Aeric Ochraquults
Duckston	Siliceous, thermic Typic Psammaquents
*Fripp	Thermic, uncoated Typic Quartzipsamments
*Hyde	Fine-silty, mixed, thermic Typic Umbraquults
Lakehurst Variant	Thermic, uncoated Haplaquodic Quartzipsamments
Munden	Coarse-loamy, mixed, thermic Aquic Hapludults
Nawney	Fine-loamy, mixed, acid, thermic Typic Fluvaquents
Newhan	Thermic, uncoated Typic Quartzipsamments
Nimmo	Coarse-loamy, mixed, thermic Typic Ochraquults
Pamlico	Sandy or sandy-skeletal, siliceous, dysic, thermic Terric Medisaprists
Pocaty	Euic, thermic Typic Sulfihemists
Portsmouth	Fine-loamy over sandy or sandy-skeletal, mixed, thermic Typic Umbraquults
Psamments	Psamments
*Rappahannock	Loamy, mixed, euic, thermic Terric Sulfihemists
*Rumford	Coarse-loamy, siliceous, thermic Typic Hapludults
State	Fine-loamy, mixed, thermic Typic Hapludults
Tetotum	Fine-loamy, mixed, thermic Aquic Hapludults
Tomotley	Fine-loamy, mixed, thermic Typic Ochraquults
Udorthents	Udorthents
Yeopim	Fine-silty, mixed, thermic Aquic Hapludults

☆ U.S. GOVERNMENT PRINTING OFFICE: 1985 O - 431-234 QL 3

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (http://www.targetcenter.dm.usda.gov/) or call (202) 720-2600 (Voice/TTY).

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

AREAS DOMINATED MOSTLY BY POORLY DRAINED TO WELL DRAINED SOILS; ON UPLANDS

1 — Acredale-Tomotley-Nimmo: Poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

2 — State-Tetotum-Augusta: Well drained, moderately well drained, and somewhat poorly drained soils that have a loamy subsoil; formed in marine and fluvial sediments

3 — Dragston-Munden-Bojac: Somewhat poorly drained, moderately well drained, and well drained soils that have a loamy subsoil; formed in marine and fluvial sediments

4 — Udorthents-Urban land: Well drained or moderately well drained soils that have a loamy substratum and areas covered by buildings and roads; formed in disturbed material

AREAS DOMINATED MOSTLY BY VERY POORLY DRAINED MINERAL AND ORGANIC SOILS; IN MARSHES AND SWAMPS THAT ARE SUBJECT TO FLOODING

5 — Dorovan-Pocaty-Nawney: Very poorly drained soils that consist of organic or loamy material; formed in organic material or fluvial sediments

6 — Backbay-Nawney: Very poorly drained soils that have a thin organic surface layer over a loamy substratum; formed in fluvial sediments

AREAS DOMINATED MOSTLY BY VERY POORLY DRAINED TO EXCESSIVELY DRAINED, SANDY SOILS; IN COASTAL AREAS

7 — Newhan-Duckston-Corolla: Excessively drained to poorly drained soils that have a sandy substratum; formed in marine and eolian sediments

8 — Pamlico-Fripp-Lakehurst Variant: Very poorly drained, excessively drained, and moderately well drained soils that are organic or sandy; formed in organic material or in marine or eolian sediments

Compiled 1981

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY

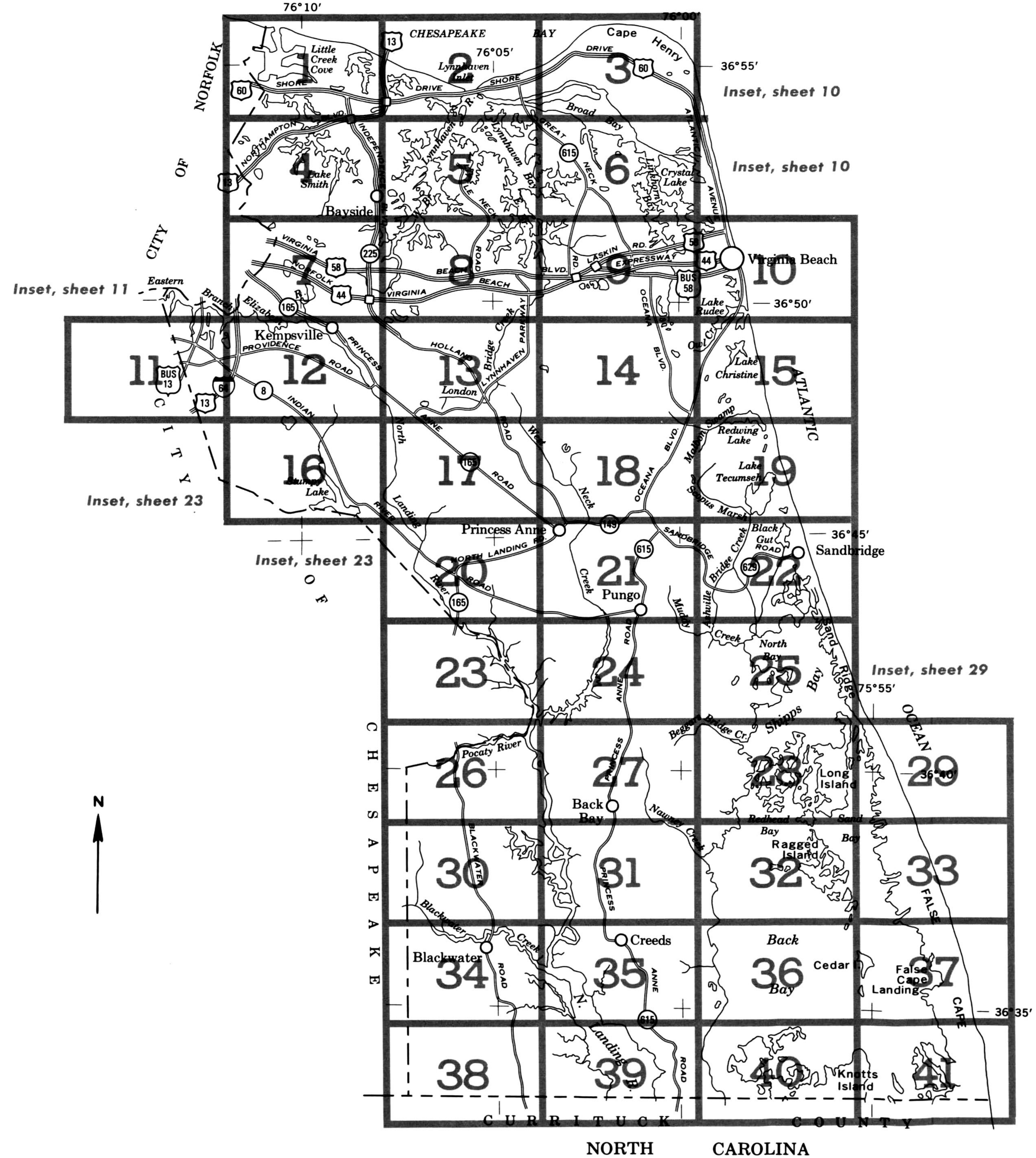
GENERAL SOIL MAP

CITY OF VIRGINIA BEACH, VIRGINIA

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km



INDEX TO MAP SHEETS

CITY OF VIRGINIA BEACH, VIRGINIA

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

SOIL LEGEND

Publication symbols consist of numbers or a combination of numbers and letters (e.g. 7, 16E, or 23C). The initial numbers represent the kind of soil. A capital letter of A, B, C, D, E, or F following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils, soils named for higher categories, or for miscellaneous areas.

SYMBOL	NAME
1	Acredale silt loam
2	Acredale-Urban land complex
3	Augusta loam
4	Augusta-Urban land complex
5	Backbay mucky peat
6	Beaches
7	Bojac fine sandy loam
8	Chapanoke silt loam
9	Chapanoke-Urban land complex
10	Corolla fine sand
11	Corolla-Duckston fine sands
12	Dorovan mucky peat
13	Dragston fine sandy loam
14	Dragston-Urban land complex
15	Duckston fine sand
16E	Fripp sand, 2 to 30 percent slopes
17	Hyde silt loam
18	Lakehurst Variant sand
19	Munden fine sandy loam
20	Munden-Urban land complex
21	Nawney silt loam
22E	Newhan fine sand, 2 to 30 percent slopes
23C	Newhan-Corolla fine sands, 0 to 15 percent slopes
24	Nimmo loam
25	Nimmo-Urban land complex
26	Pamlico mucky peat, ponded
27	Pamlico-Lakehurst Variant complex
28	Pocaty peat
29	Portsmouth loam
30	Psamments, undulating
31	Psamments-Urban land complex
32	Rappahannock mucky peat, strongly saline
33E	Rumford fine sandy loam, 6 to 35 percent slopes
34A	State loam, 0 to 2 percent slopes
34B	State loam, 2 to 6 percent slopes
35	State-Urban land complex
36	Tetotum loam
37	Tetotum-Urban land complex
38	Tomotley loam
39	Tomotley-Urban land complex
40	Udorthents, loamy
41	Udorthents-Urban land complex
42	Urban land
43	Yeopim silt loam
44	Yeopim-Urban land complex
W	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label) — Hedley Airstrip

- Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 173
- State — 28
- County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot (2 acres or less)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 12, 19

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

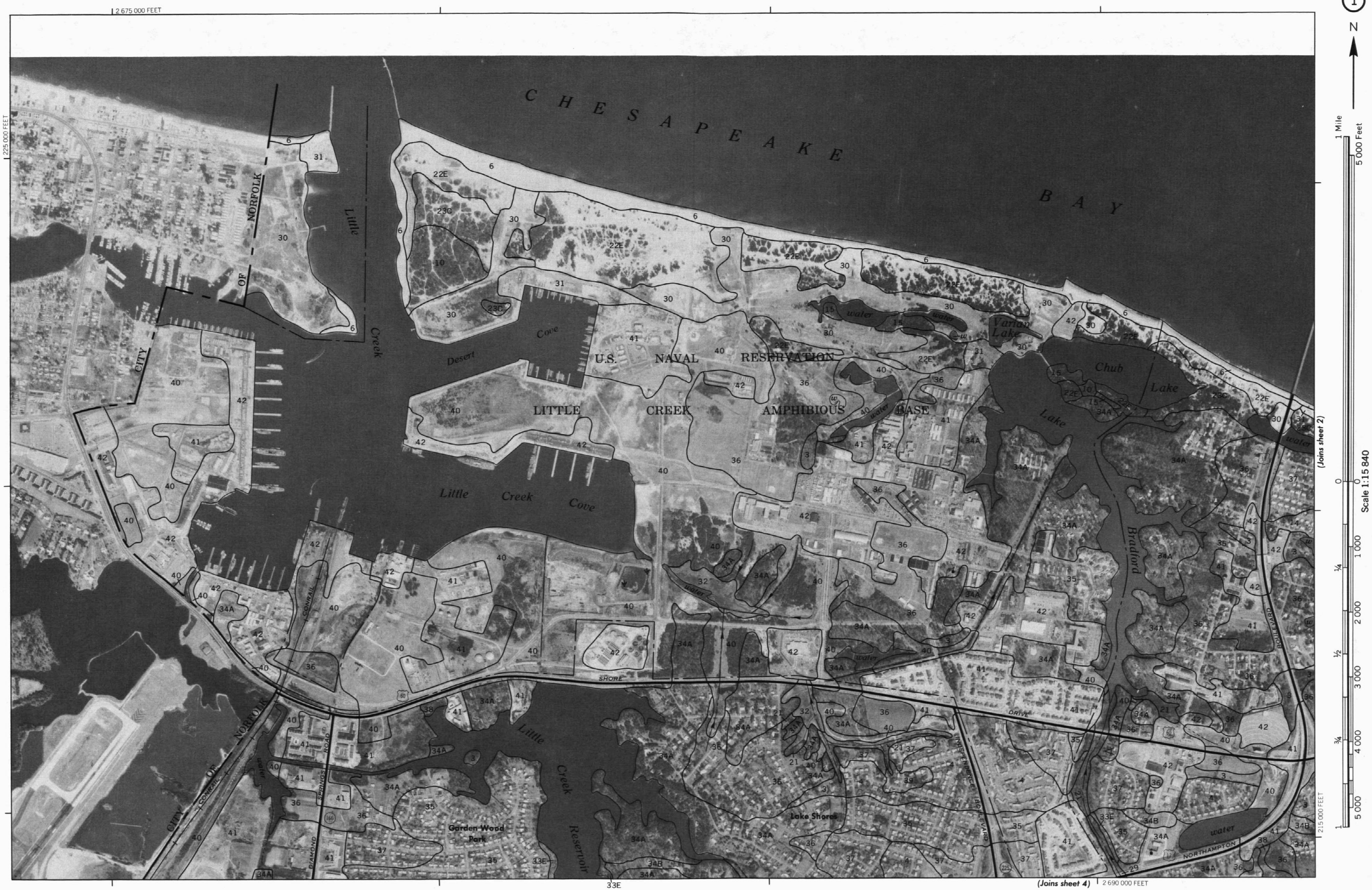
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Blowout
- Clay spot
- Gravelly spot (2 acres or less)
- Gumbo, slick or scabby spot (sodic)
- Dumps and other similar non soil areas (2 acres or less)
- Prominent hill or peak
- Rock outcrop (includes sandstone and shale)
- Saline spot
- Sandy spot (2 acres or less)
- Severely eroded spot
- Slide or slip (tips point upslope)
- Stony spot, very stony spot
- Udorthents, loamy (2 acres or less)



CITY OF VIRGINIA BEACH, VIRGINIA NO. 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 2

CITY OF VIRGINIA BEACH, VIRGINIA NO. 2

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

3

CITY OF VIRGINIA BEACH, VIRGINIA NO. 3

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

4

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 5

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

6

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 6

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 7

CITY OF VIRGINIA BEACH, VIRGINIA NO. 7

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

8

N

(Joins sheet 5)

(Joins sheet 13)

1 Mile
5 000 Feet
0
1 000
¼
2 000
½
3 000
4 000
¾
5 000
1
Scale 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 8

9

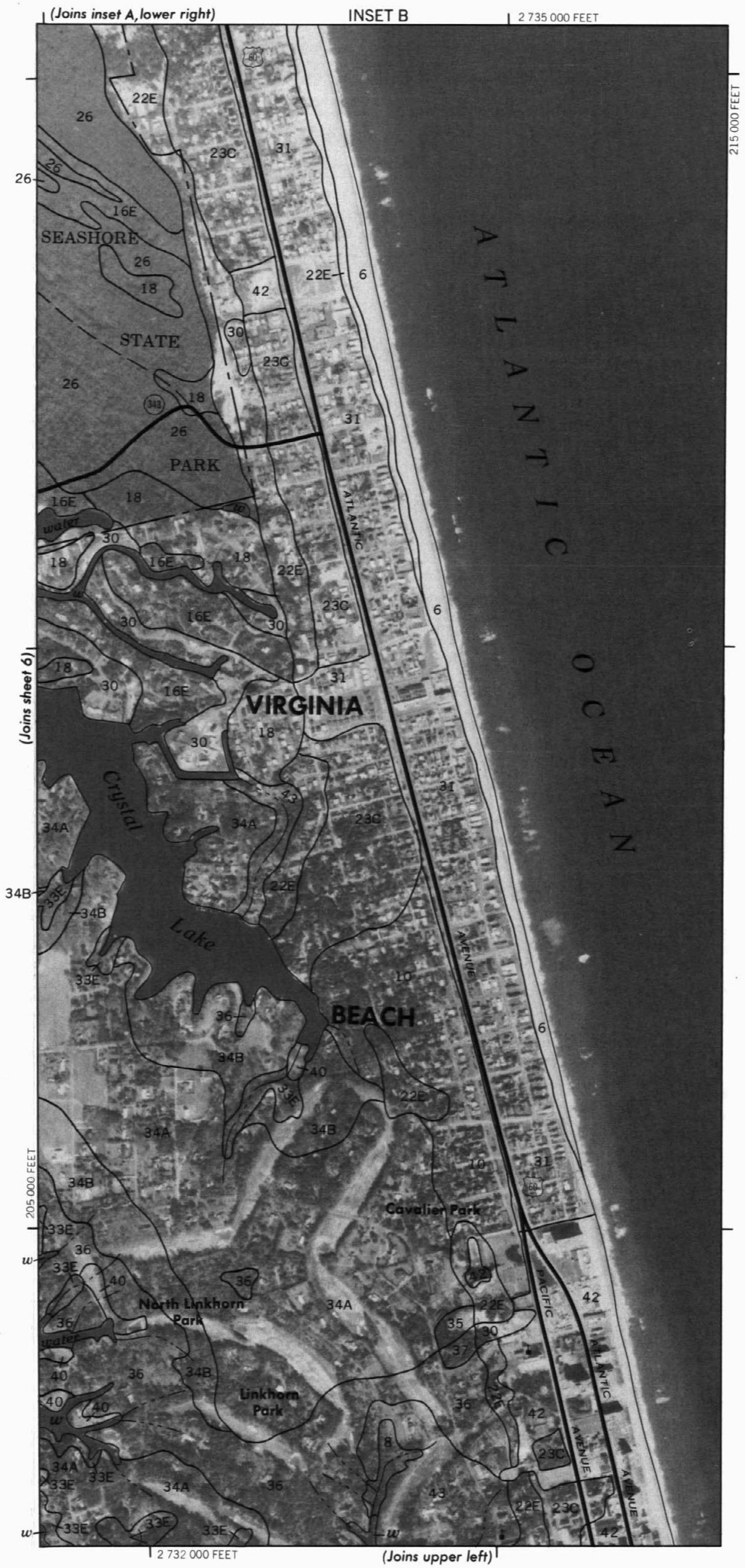
CITY OF VIRGINIA BEACH, VIRGINIA NO. 9

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

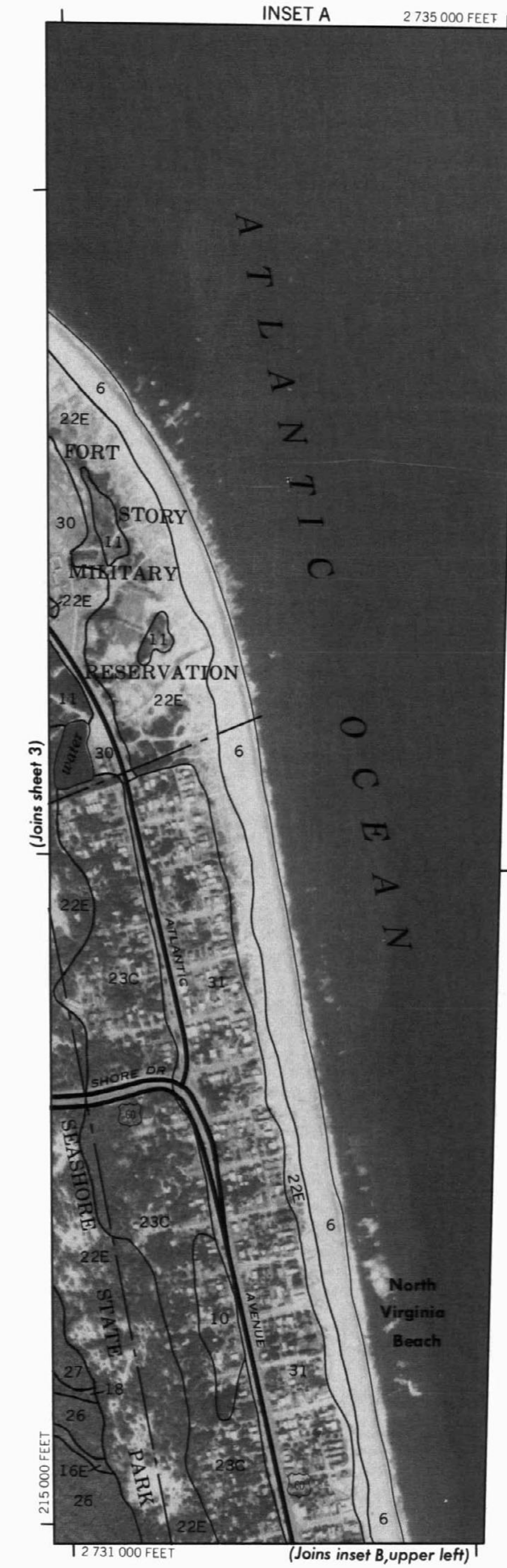
N

1 Mile
5 000 Feet
Scale 1:15 840

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 10



3000 AND 5000-FOOT GRID TICKS

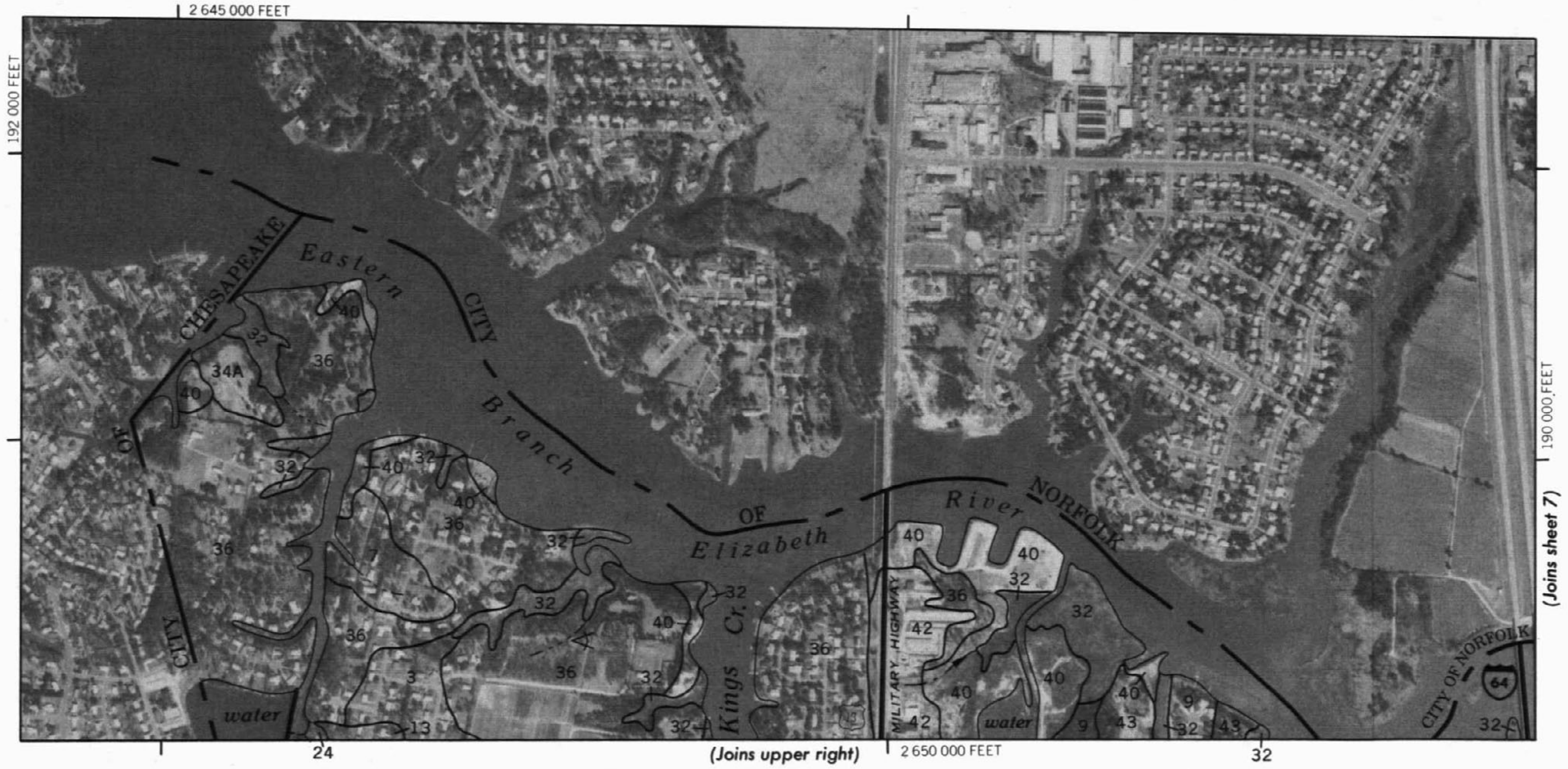


3000 AND 5000-FOOT GRID TICKS

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 11

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



2000 AND 5000-FOOT GRID TICKS

N

1 Mile

5 000 Feet

Scale 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 12

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 13

CITY OF VIRGINIA BEACH, VIRGINIA NO. 13

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 15

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 16

(Joins sheet 12)

2 690 000 FEET

175 000 FEET

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

0 1 000 2 000 3 000 4 000 5 000

(Joins inset A, sheet 23)

165 000 FEET

(Joins sheet 17)

2 680 000 FEET

(Joins inset B, sheet 23)

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 16

CITY OF VIRGINIA BEACH, VIRGINIA NO. 17

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 18

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 19

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 20

N

1 Mile
5 000 Feet
0
Scale 1:15 840
1 000
¼
2 000
½
3 000
¾
4 000
5 000
1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 20

CITY OF VIRGINIA BEACH, VIRGINIA NO. 21

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

22

N

1 Mile

5 000 Feet

Scale 1:15 840

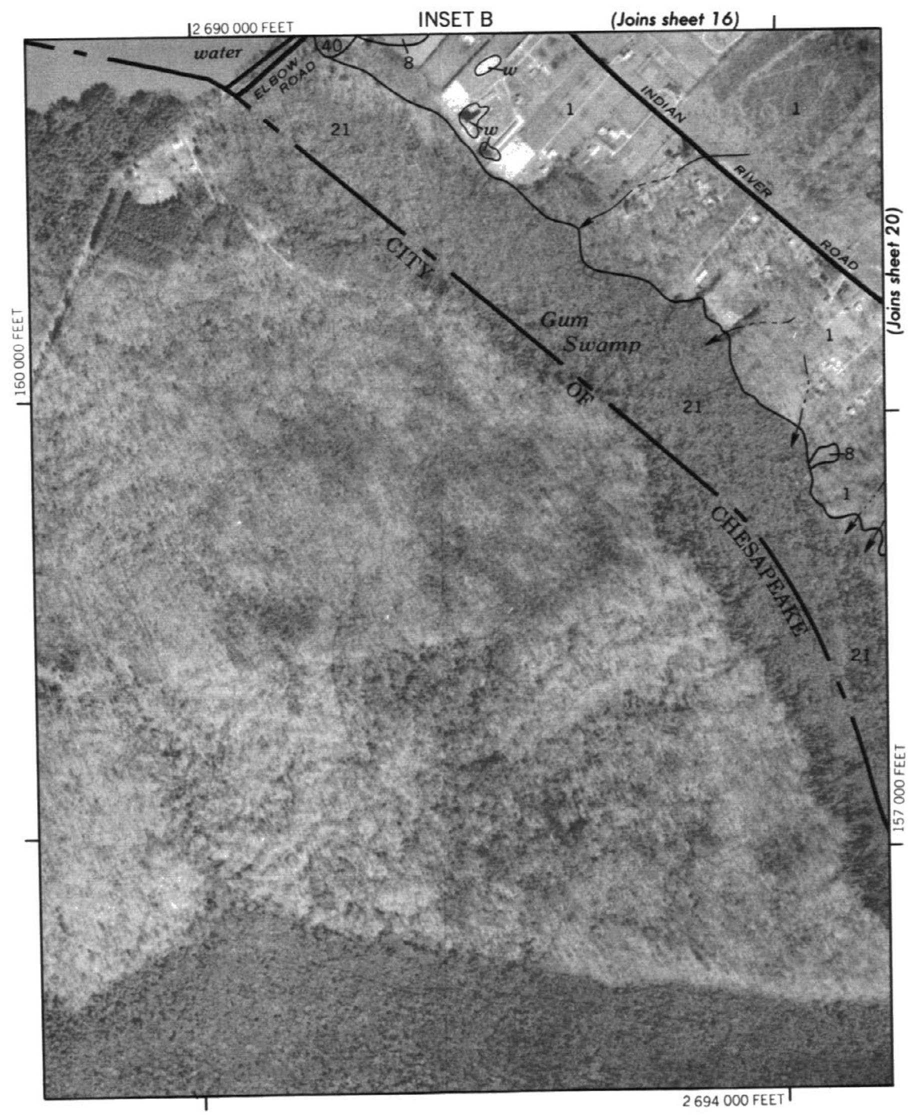
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 22

INSET A

3000 AND 5000-FOOT GRID TICKS

INSET B



3000 AND 4000-FOOT GRID TICKS

CITY OF VIRGINIA BEACH, VIRGINIA NO. 23

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 24

CITY OF VIRGINIA BEACH, VIRGINIA NO. 25

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 26

N

(Joins sheet 23)

1 Mile
5 000 Feet
Scale 1:15 840
0
1/4
1/2
3/4
1
1 000
2 000
3 000
4 000
5 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 27

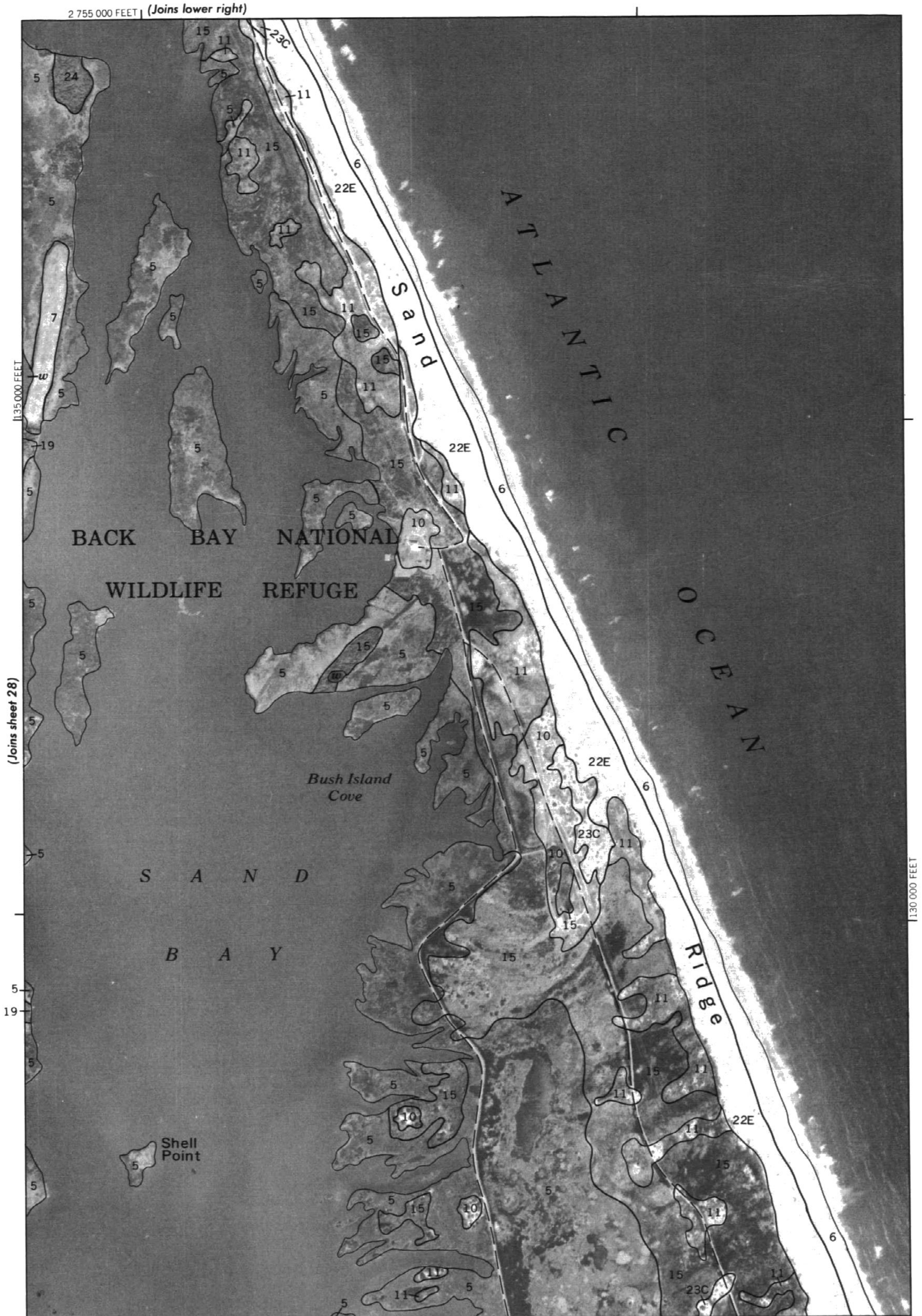
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

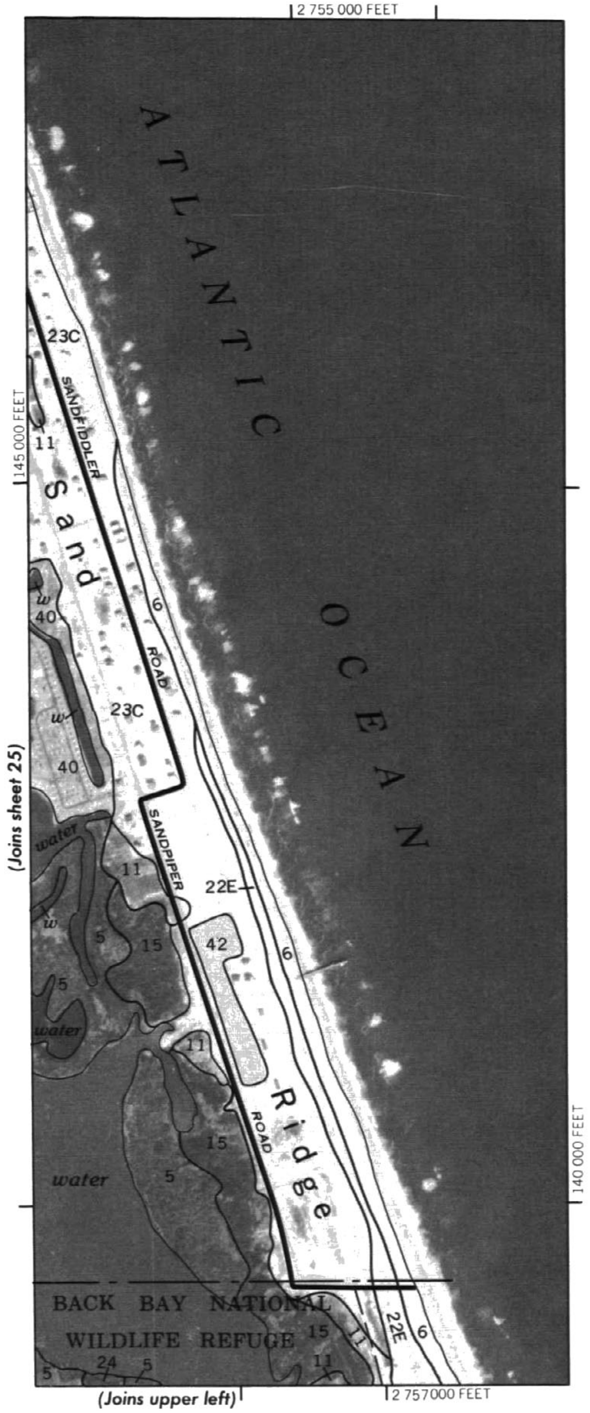
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 28

CITY OF VIRGINIA BEACH, VIRGINIA NO. 29

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





2000 AND 5000-FOOT GRID TICKS

N

1 Mile
5 000 Feet
Scale 1:15 840

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 30

N

1 Mile
5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

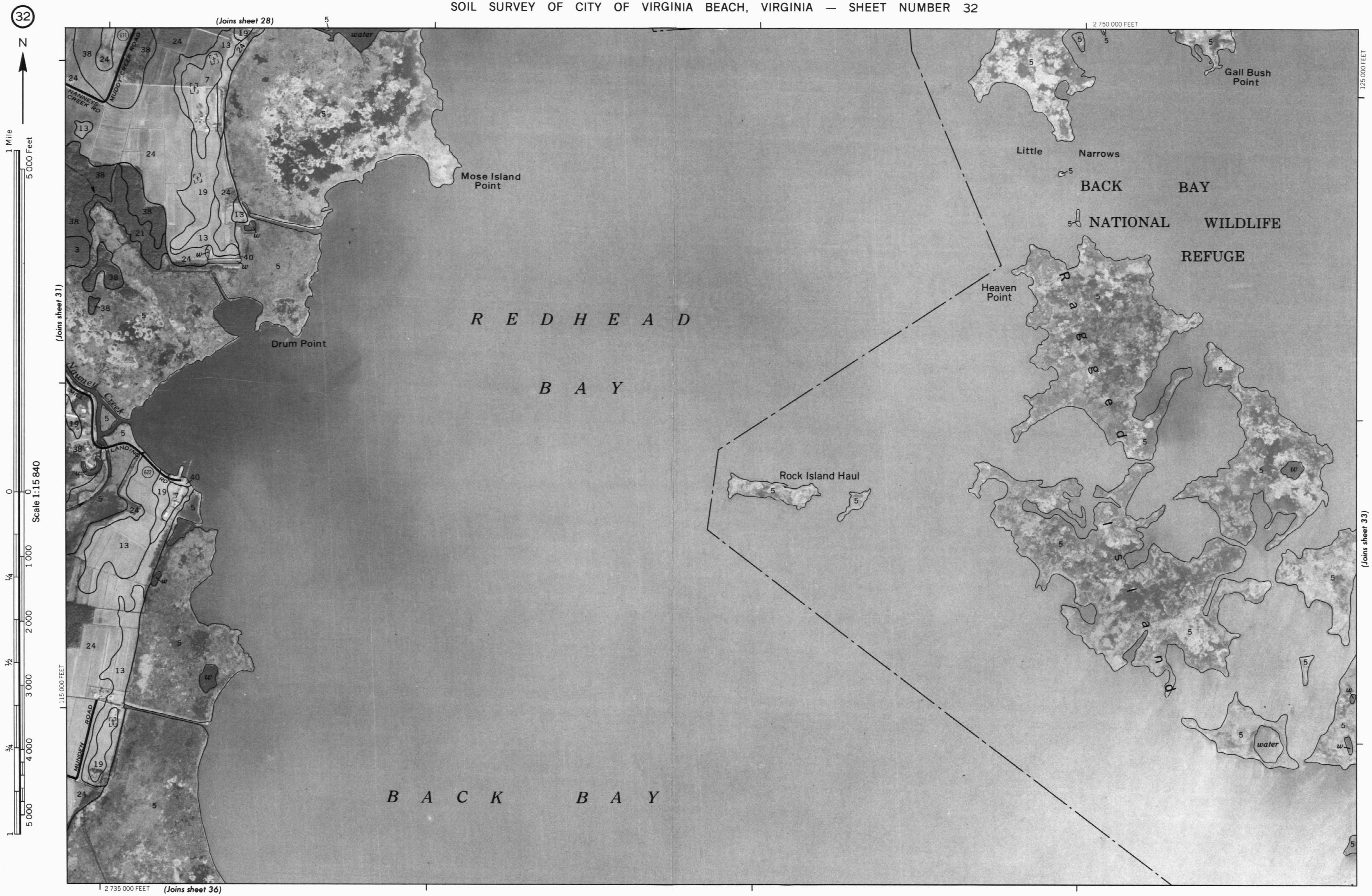
0 1 000 2 000 3 000 4 000 5 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 30

CITY OF VIRGINIA BEACH, VIRGINIA NO. 31

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 19[illegible]4 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

33

CITY OF VIRGINIA BEACH, VIRGINIA NO. 33

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 Mile
5 000 Feet
0
Scale 1:15 840
0
1 000
¼
2 000
½
3 000
¾
4 000
5 000
1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 34

CITY OF VIRGINIA BEACH, VIRGINIA NO. 35

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

35

N

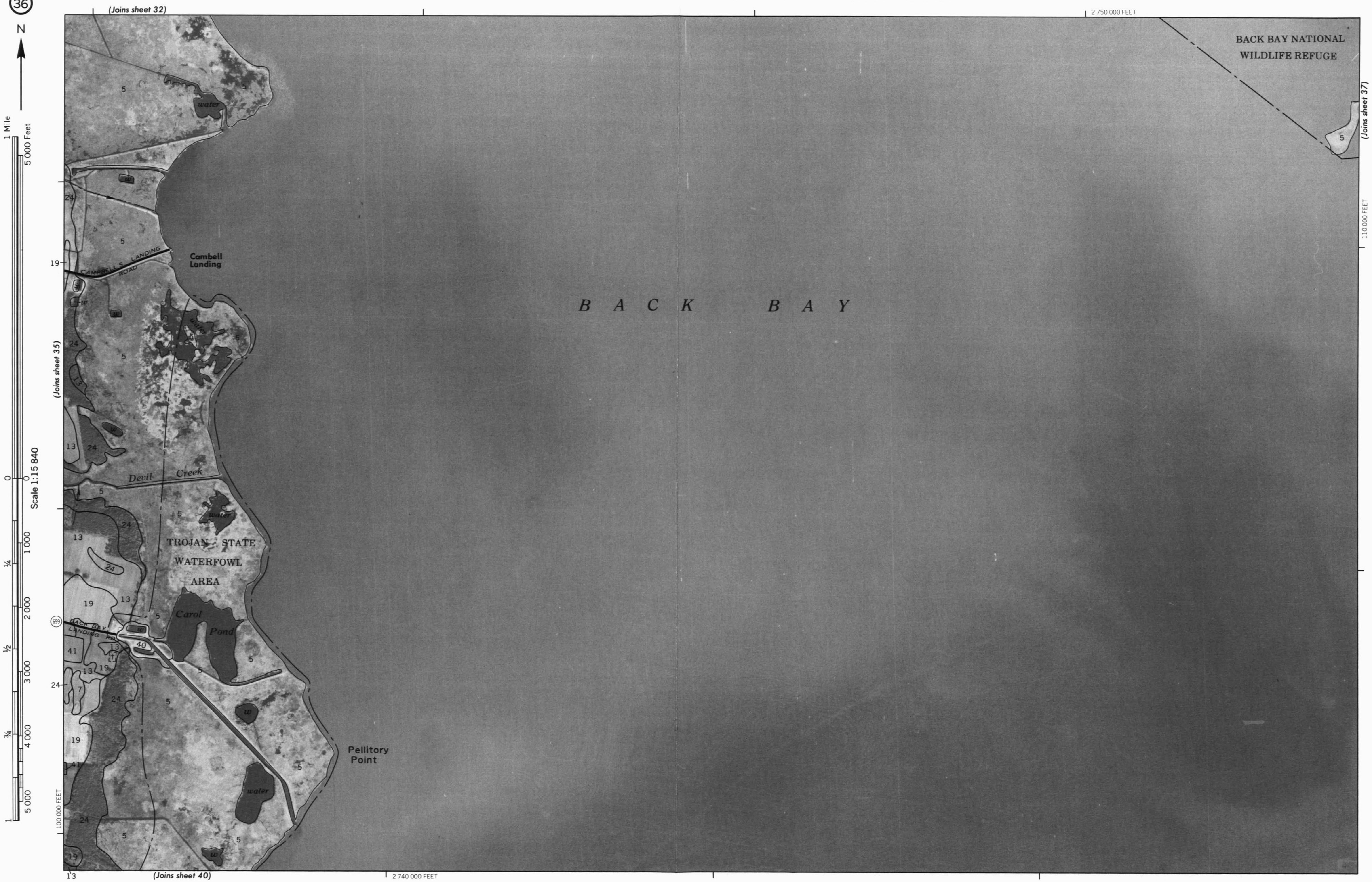
1 Mile

5 000 Feet

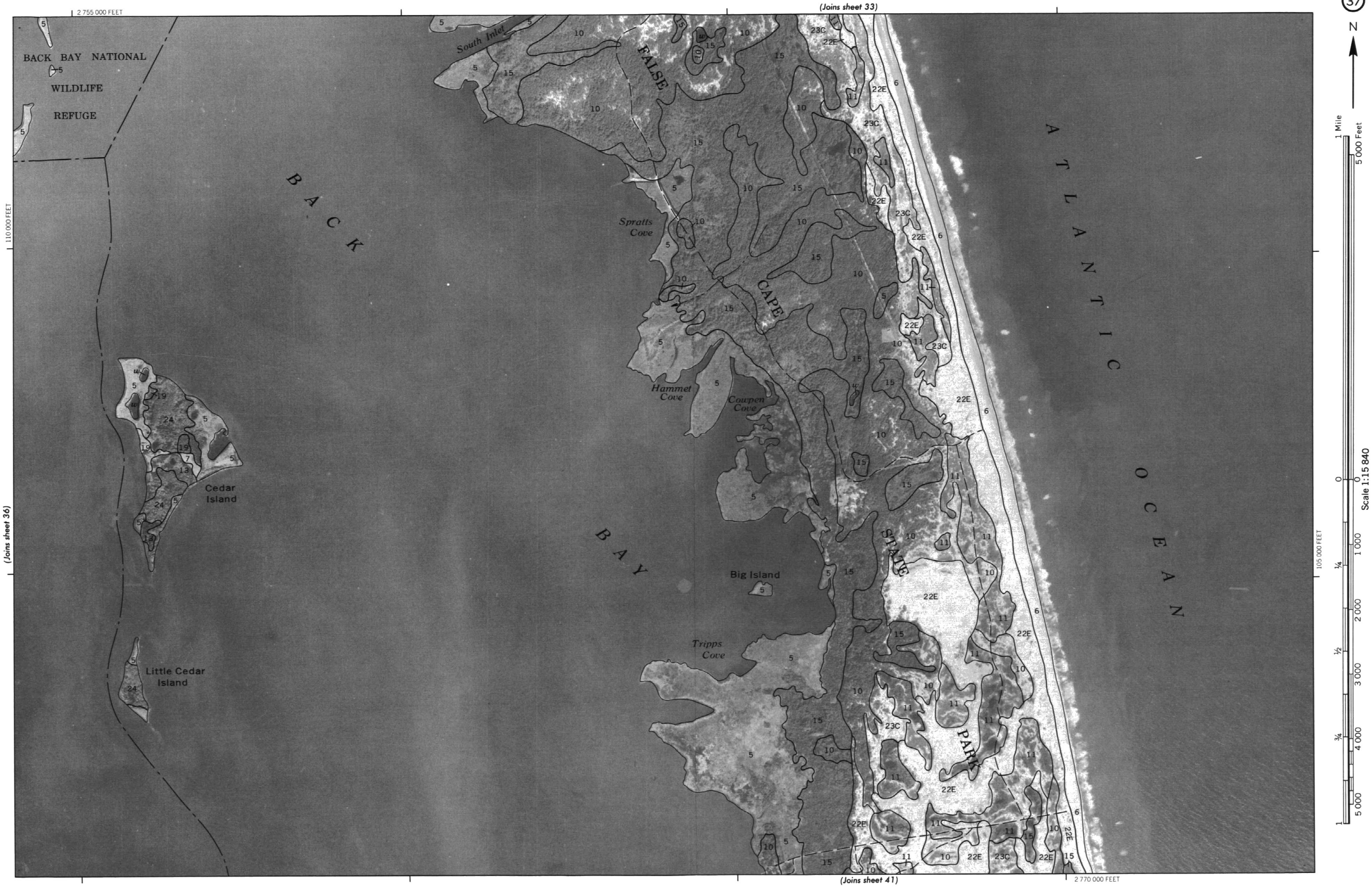
Scale 1:15 840

0 1/4 1/2 3/4 1

0 1000 2000 3000 4000 5000



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



CITY OF VIRGINIA BEACH, VIRGINIA NO. 37
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(38)

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 38

39

N

Scale 1:15 840

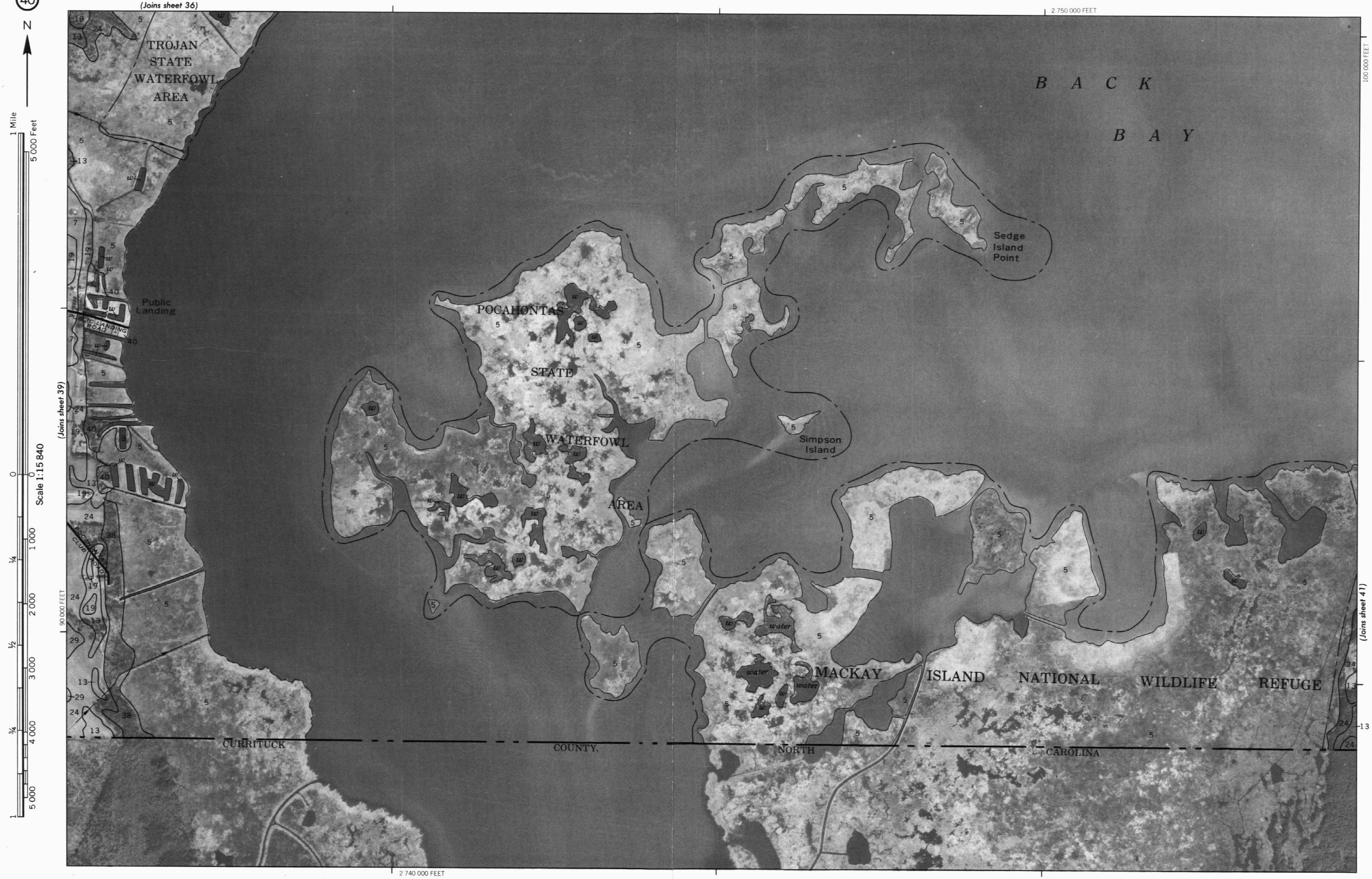
1 Mile

5 000 Feet

CITY OF VIRGINIA BEACH, VIRGINIA NO. 39

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 19[illegible]4 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF CITY OF VIRGINIA BEACH, VIRGINIA — SHEET NUMBER 40



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

CITY OF VIRGINIA BEACH, VIRGINIA NO. 40

CITY OF VIRGINIA BEACH, VIRGINIA NO. 41

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1974 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 Mile
5 000 Feet
Scale 1:15 840
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000